



Chapter 4

Framing Crew

SPECIAL MATERIALS FOR FRAMING

A number of Super Good Cents materials specifications affect the framer. The program requires low formaldehyde ratings for structural panels such as plywood and oriented strand board. In some homes, 24-inch on center framing requires structural sheathing that is span-rated for 24 inches on center. Some houses may require special trusses or exterior insulating sheathing. When you are bidding on a Super Good Cents house, check with the general contractor so you can anticipate these special requirements.

You also may be installing new attic ventilation products, special exhaust fan jacks that are actually close to exhaust fans, and through-the-wall fresh air inlets.

ENERGY EFFICIENT FLOOR FRAMING

Joisted Floor Systems

Deeper joists, longer spans, and fewer beam runs under the floor make floor construction easier and quicker for the framer. Joisted floors are easier to insulate too.

Sheathing (stamped “Exterior,” “Exposure 1,” or “HUD-Approved”) over the joists usually provides the 1-perm vapor retarder that is required to protect floor insulation from indoor moisture. Sheathing also makes it easier to control air leakage through the floor, compared to a floor built with decking.

Post and Beam Floors

Post and beam floors with decking subfloors are acceptable, but their energy performance often is inferior to joisted floor systems. It is harder and more costly to install thick insulation below decking floors. Since 2x decking shrinks, it is difficult to control air leakage through the floor. Because decking has no perm rating, a separate vapor retarder must be installed to protect floor insulation from indoor moisture. Some post and beam floor systems use plywood or other manufactured wood panels as the subfloor, rather than 2x decking. These materials greatly reduce air leakage through the floor. They may act as a vapor retarder too.

Air Sealing at Floor Framing

Figures 4A and 4B show framing and insulation details for floor systems. They also show air sealing at the rim or floor perimeter that can be done best during floor framing. Seal air leaks above and below the mudsill when using post and beam floors.



If the house uses the Advanced Air Leakage option (see Chapter 9), the floor must have a continuous air barrier. If the home has a sheathing subfloor, you can turn the sheathing into an air barrier by gluing all edges of the sheathing as it is installed. See Figure 4C. If the house has a 2x decking subfloor, install a separate air barrier, such as continuous polyethylene, above the decking. See Figure 4B.

FRAMING BASEMENT WALLS

R-21 wall insulation is typical for heated basements. Below grade, you can use 2x4s—just hold them out at least 2 inches from foundation walls. That way you will provide a minimum of 5-1/2 inches of space for insulation. See Figure 4D.

TIP: An additional inch allows an air space between the insulation and the foundation wall. That reduces the risk of dampness penetrating from the foundation wall to the insulation.

In many cases, concrete walls are half height, with framed walls above. Figure 3D in Chapter 3 shows two methods for insulating short concrete walls. Both leave a ledge at about half wall height. Another option is to frame the inside wall all the way up to the floor above. That way you leave room for two layers of wall insulation.

ADVANCED AND INTERMEDIATE WALL FRAMING

Since insulation has a higher R-value than wood, reducing wood and replacing it with insulation reduces heat loss. In a typical standard frame wall, 23 percent is wood, and 77 percent is insulated cavity. The “intermediate” frame accounts for 22 percent of the wall area, leaving 78 percent for cavity insulation. The “advanced” frame wall is approximately 17 percent wood and 83 percent insulated cavity. Advanced frame walls have about 25 percent less wood than standard frame walls.

Advanced or intermediate wall framing help homes qualify for the Super Good Cents program. Figure 4E shows that the main difference between a standard and advanced frame is the reduced amount of wood in the wall.

Advanced and Intermediate Framing Features

If approved plans indicate that the home must have advanced or intermediate framing to qualify for the Super Good Cents program, the utility representative looks for the following framing features:

Figure 4A JOISTED FLOOR

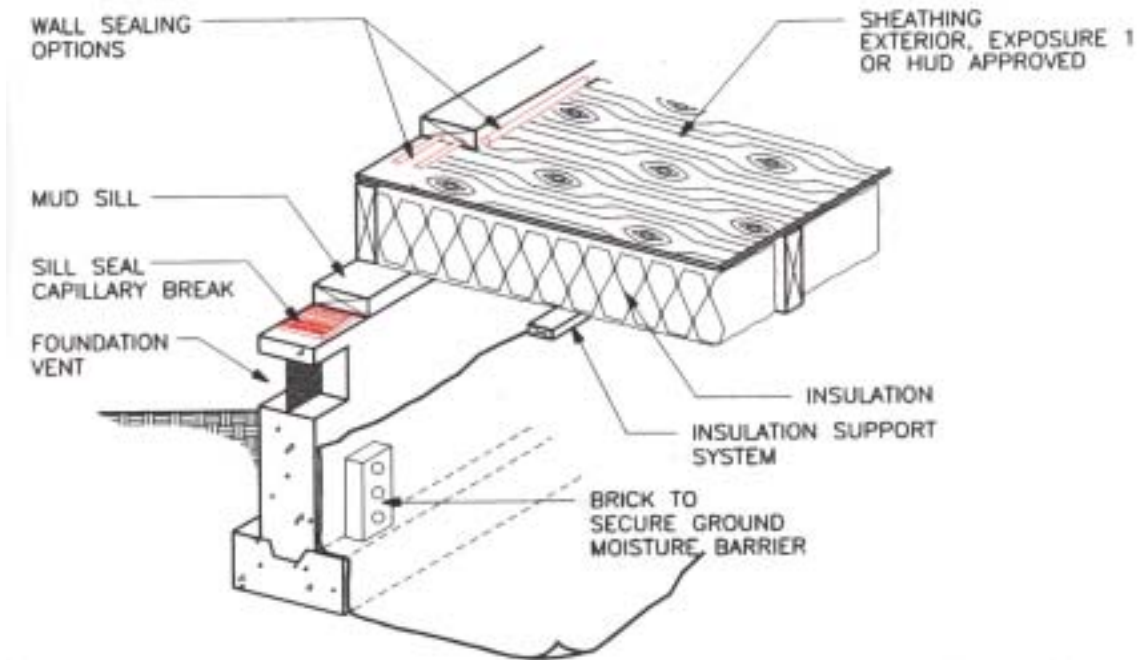


Figure 4B
POST AND BEAM FLOOR WITH DECKING SUBFLOOR

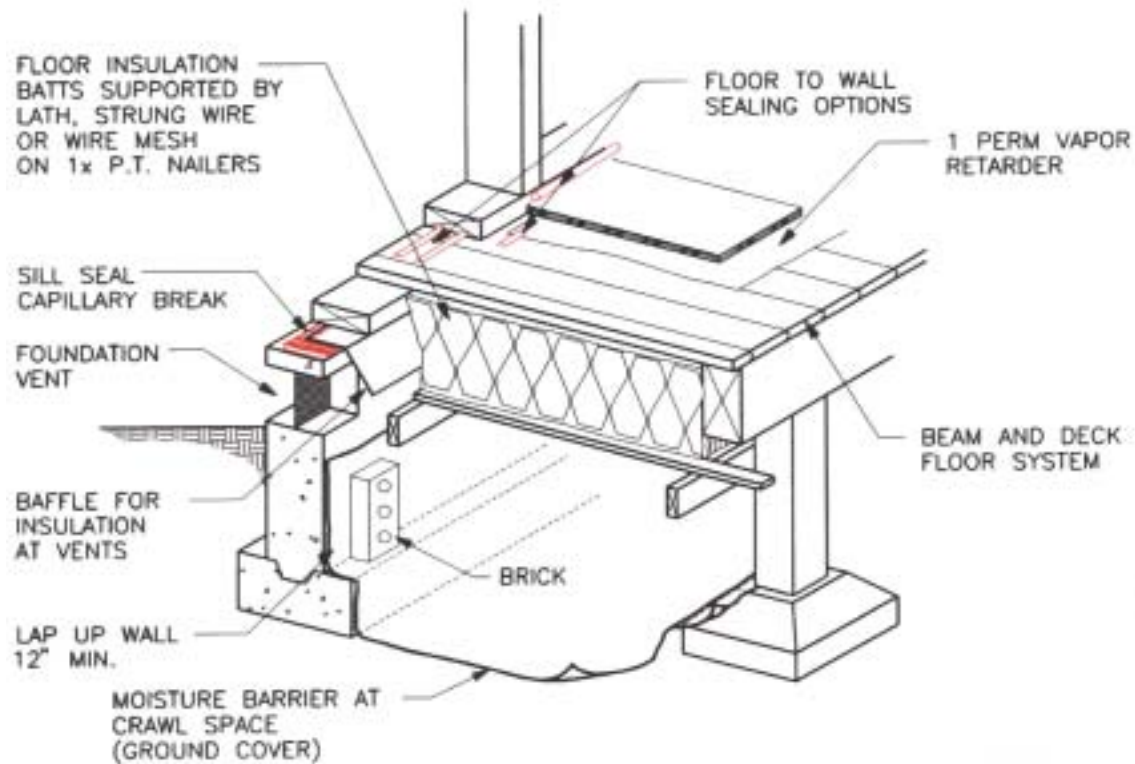


Figure 4C
FLOOR SHEATHING AIR BARRIER

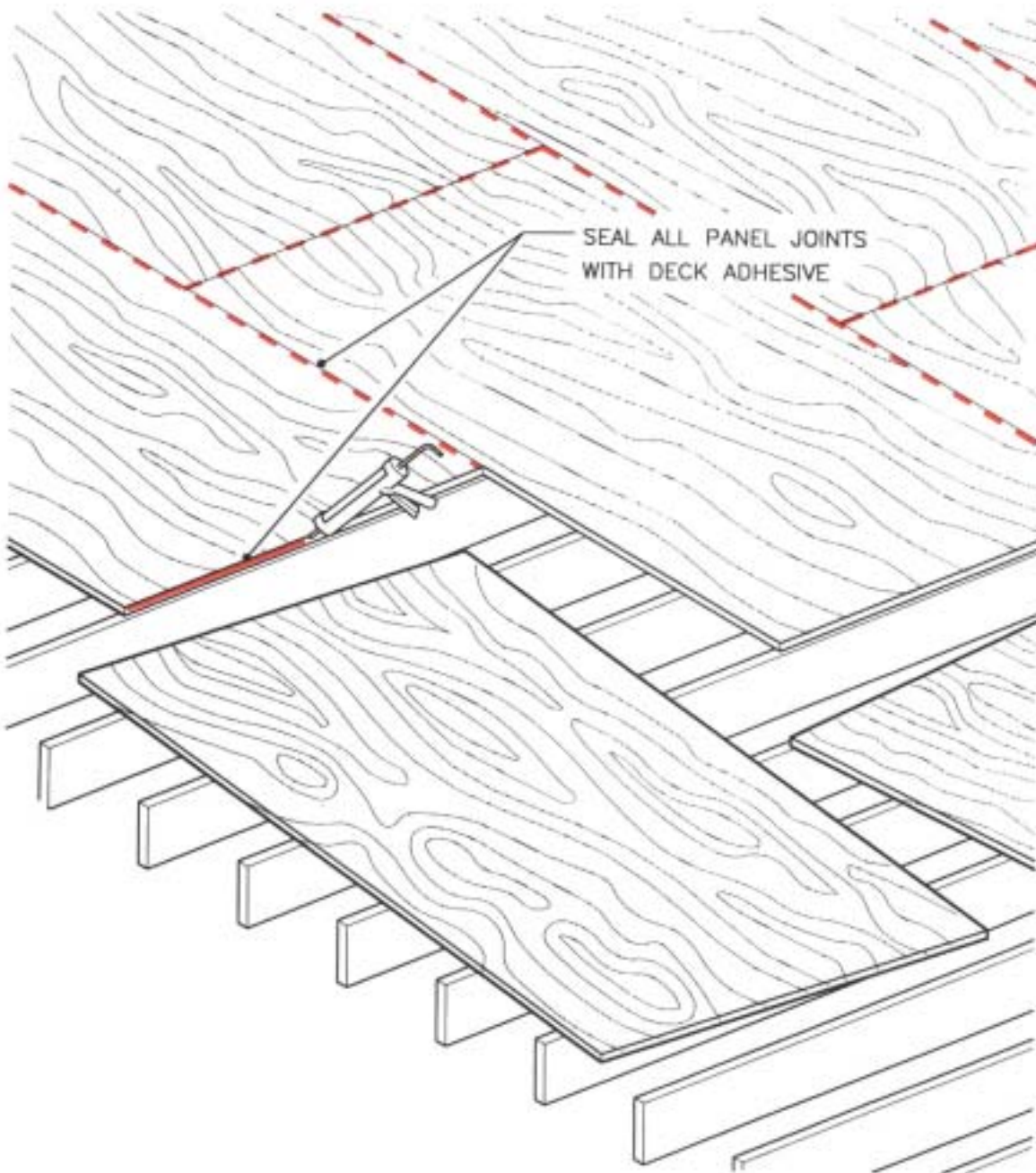
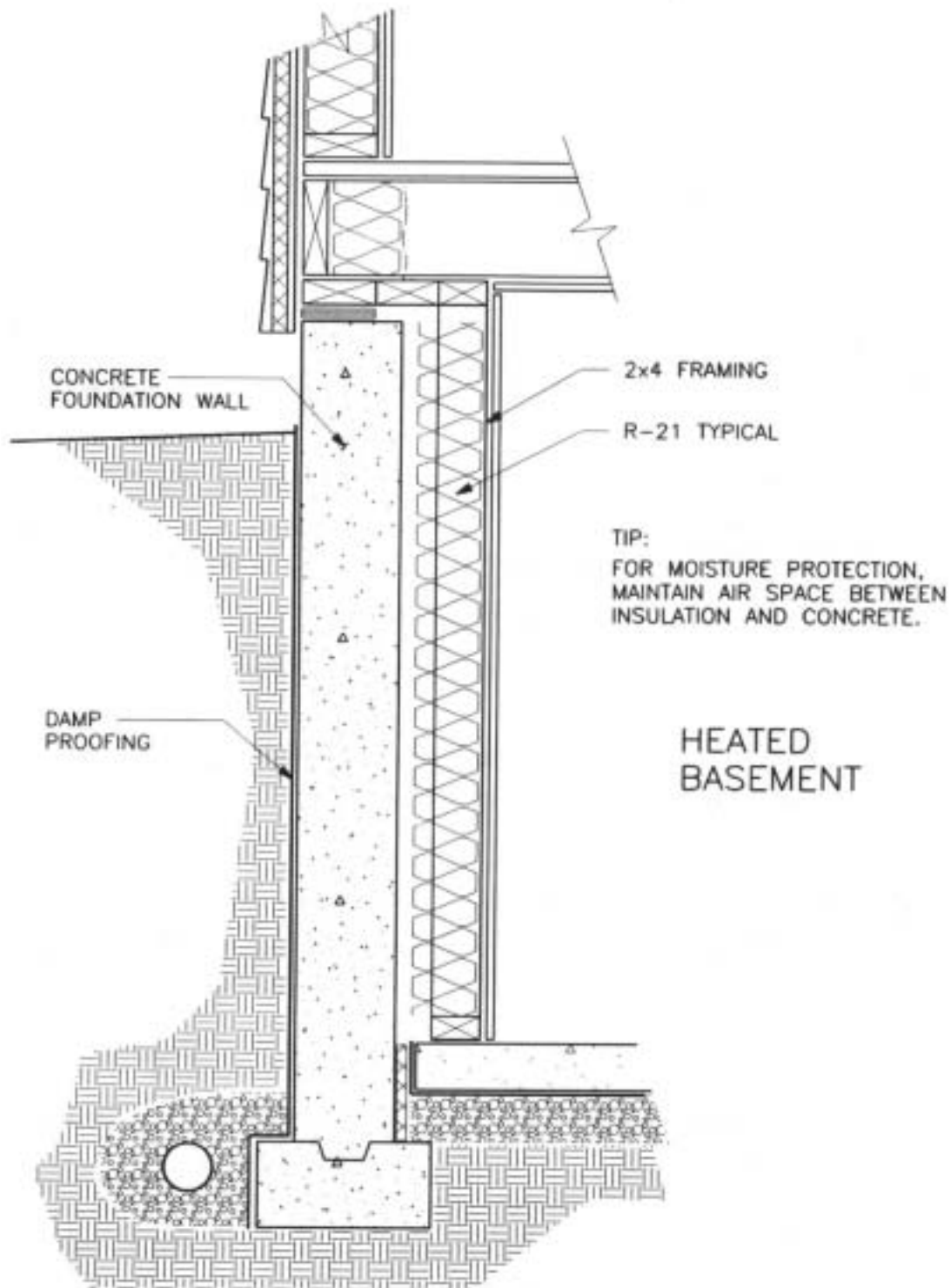




Figure 4D
BELOW GRADE WALL WITH INTERIOR INSULATION





Advanced Framing Features

2x studs on 24-inch centers

Insulated headers

Insulated corners

Full insulation behind partition wall intersections with exterior walls

Intermediate Framing Features

2x studs on 16-inch centers

Insulated headers

Insulated corners

Full insulation behind partition wall intersections with exterior walls

Optional Advanced Framing Features

Studs notched on the bottom on exterior walls so wiring runs along the bottom plates and does not compress insulation

Unnecessary cripples eliminated

Header hangers that eliminate window trimmers

Figures 4F, 4G, and 4H illustrate insulated headers, insulated corners, and insulated partition intersections.

Siding/Sheathing Considerations

If you use 24-inch on center framing, make sure siding and sheathing are rated for 24-inch spans. Span ratings are stamped on sheathing materials.

Plan Advanced Wall Layout to Allow Point Loading of Trusses

While not required for all double top plate walls, it is good practice to point load the roof trusses directly above the wall studs so roof loads are transferred directly to the foundation. Lay out the two walls that bear trusses in an identical parallel pattern, and place the trusses directly above the stud layout. See Figure 41.

Installing Through-the-Wall Air Intake Vents

In many Super Good Cents homes, framers install air intake vents through the wall of each bedroom and in at least one main living area. Several ventilation options require these vents. Some vents are designed to be installed during framing. Others can be installed during finish work. Get information on vent installation from the general contractor as early as possible.



Figure 4E

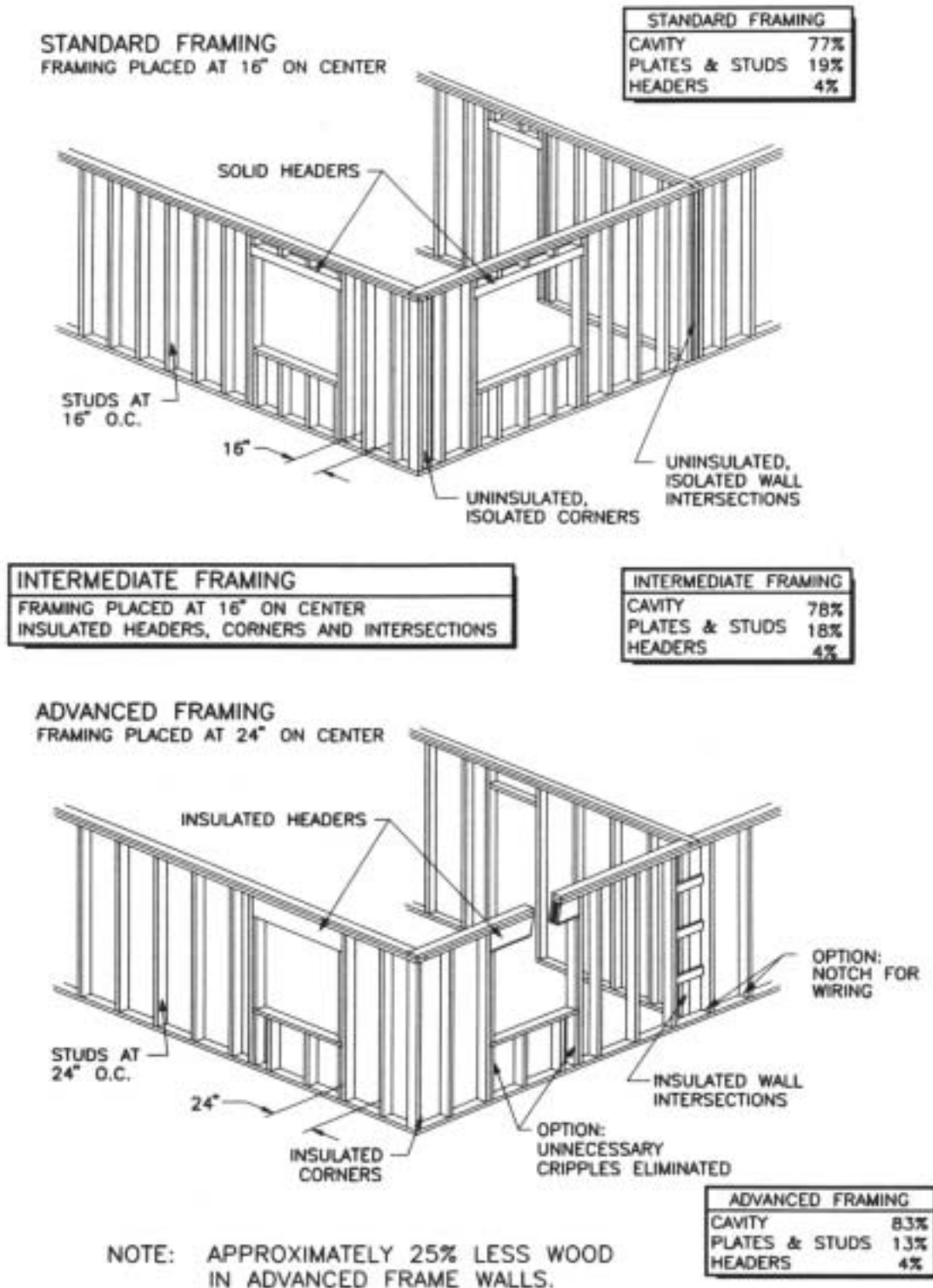
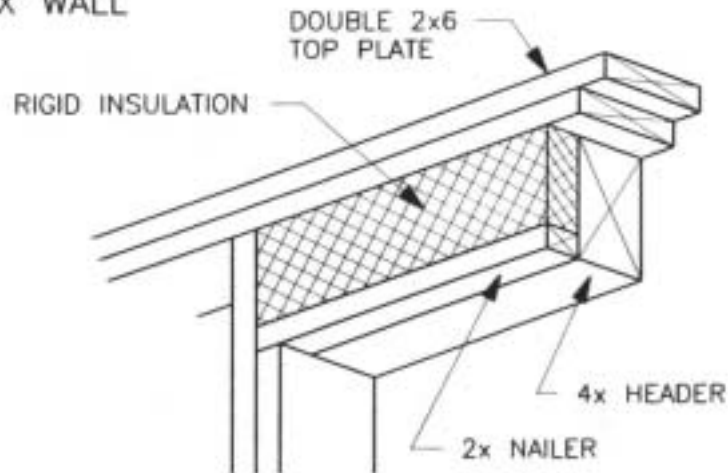
ADVANCED, INTERMEDIATE, AND STANDARD FRAMING



Figure 4F
INSULATED HEADER OPTIONS

**4X HEADER
IN 6X WALL**



NOTE: ACTUAL HEADER SIZES TO BE
CALCULATED FROM LOADING CONDITIONS

SANDWICH HEADER

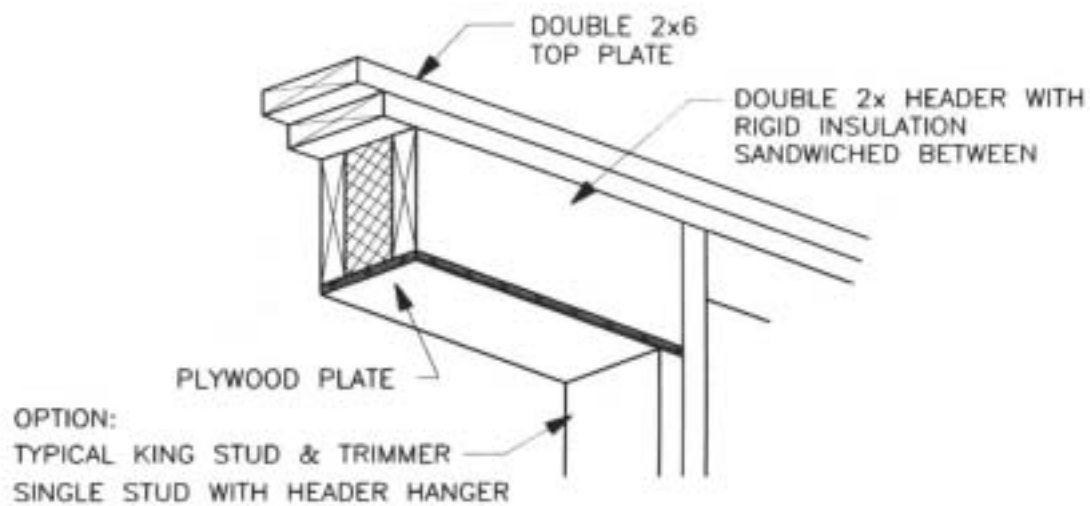
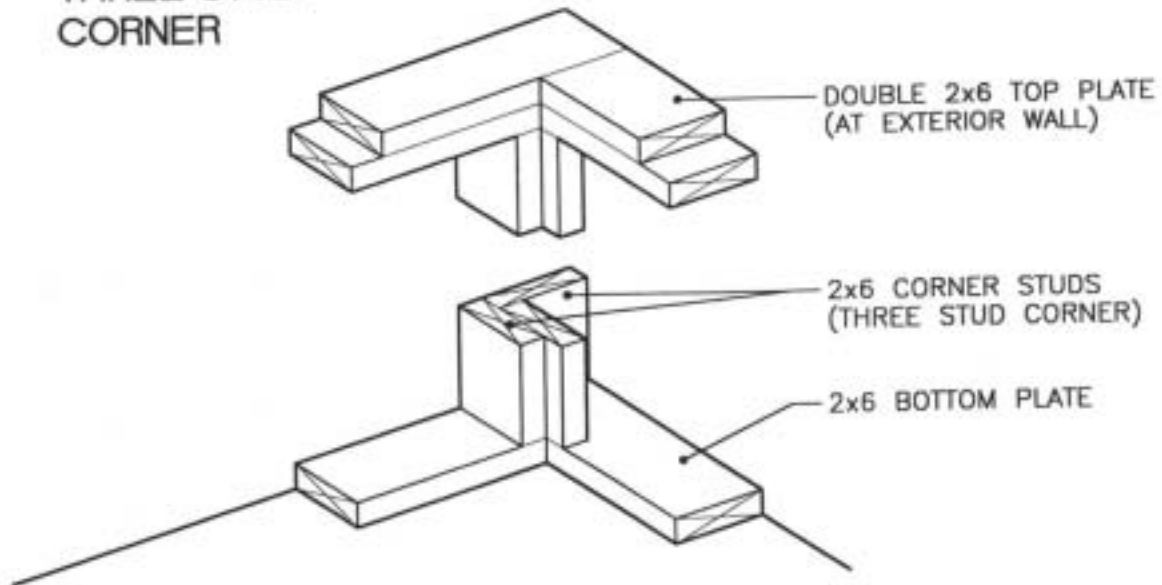




Figure 4G
INSULATED CORNER OPTIONS

THREE STUD CORNER



TWO STUD CORNER

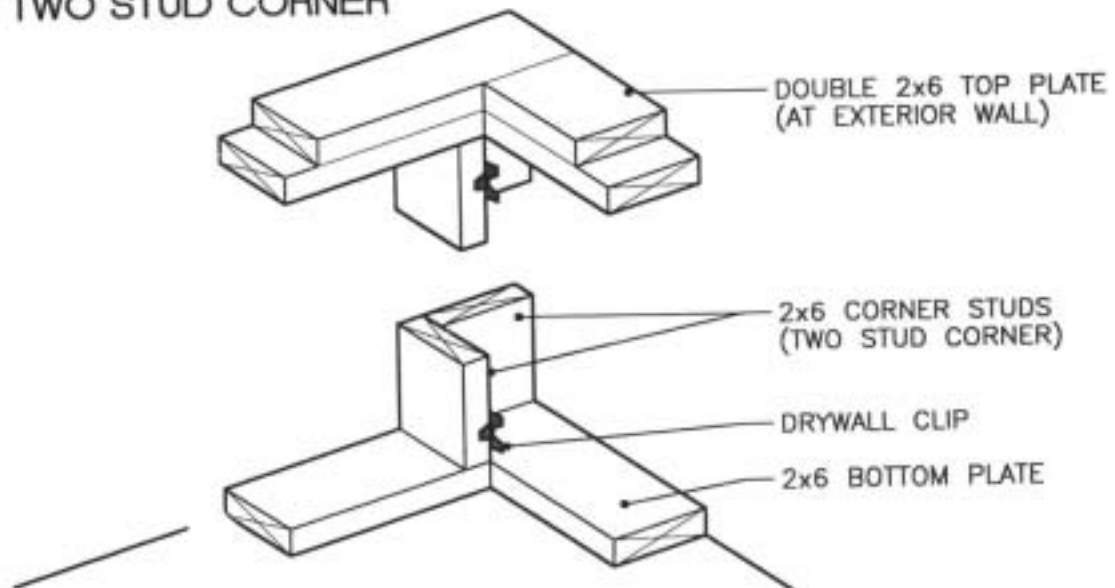




Figure 4H
INSULATED PARTITION INTERSECTION OPTIONS

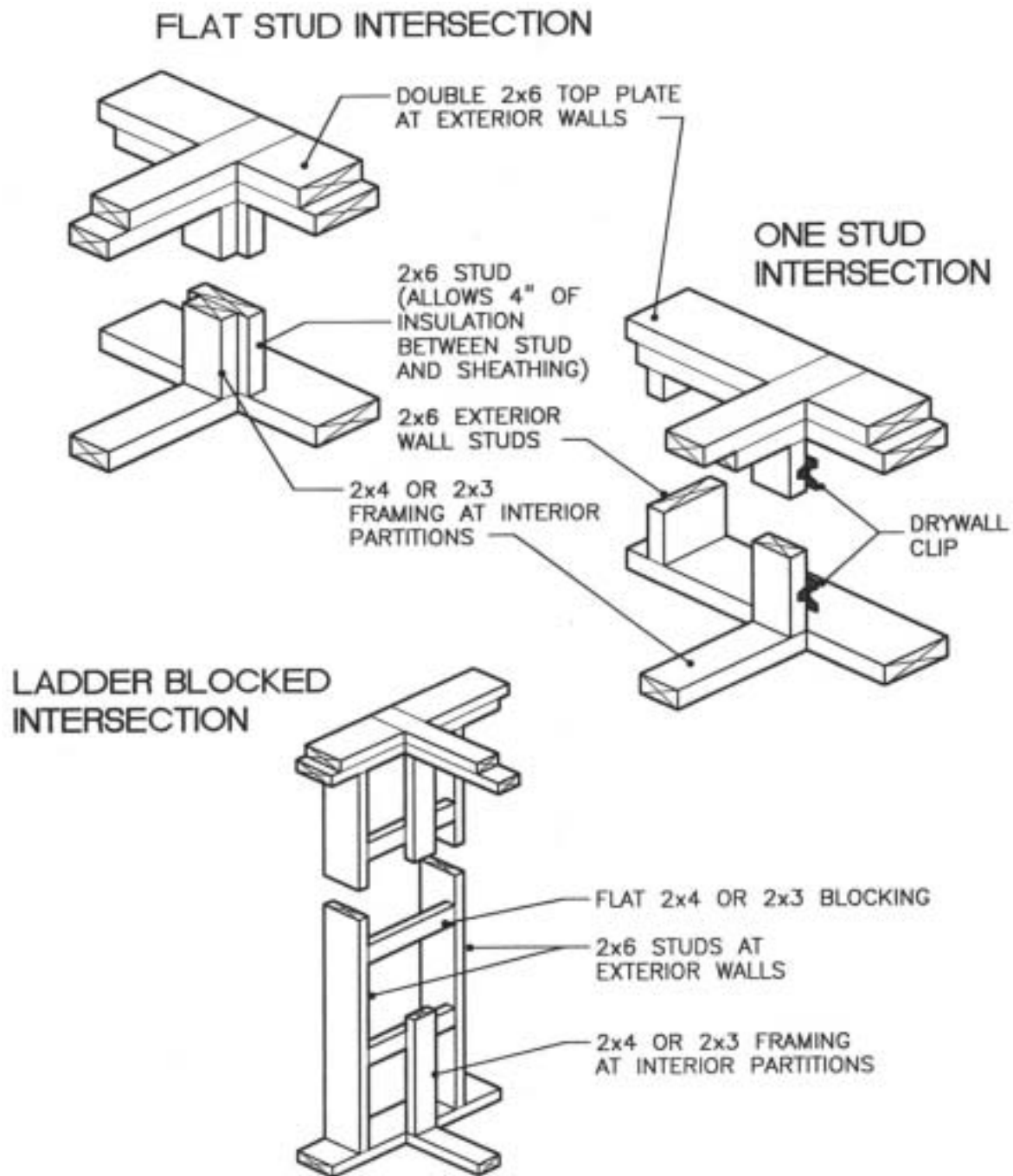
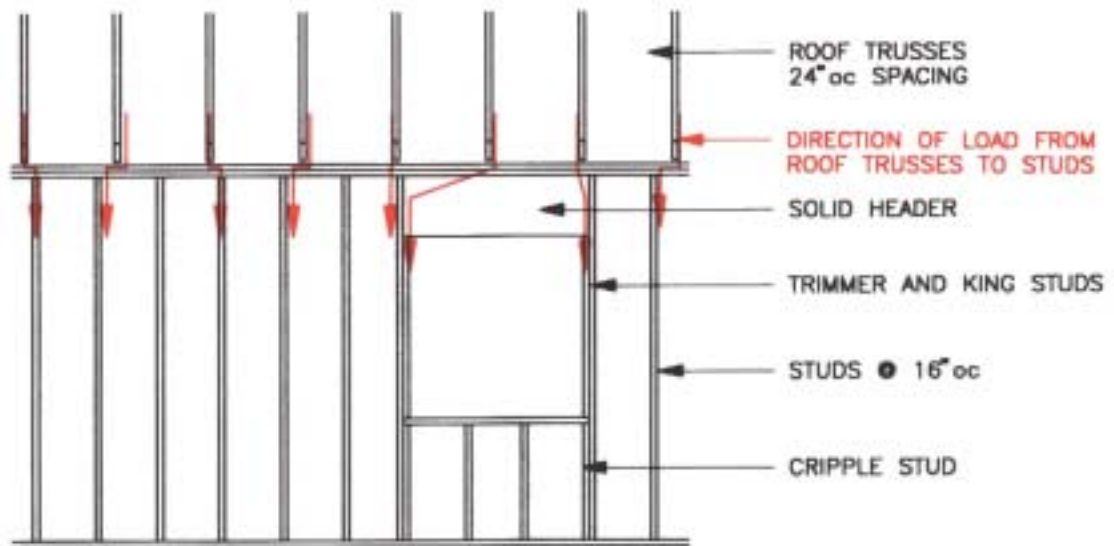




Figure 4I
POINT LOADING TRUSSES

STANDARD LOADING



POINT LOADING

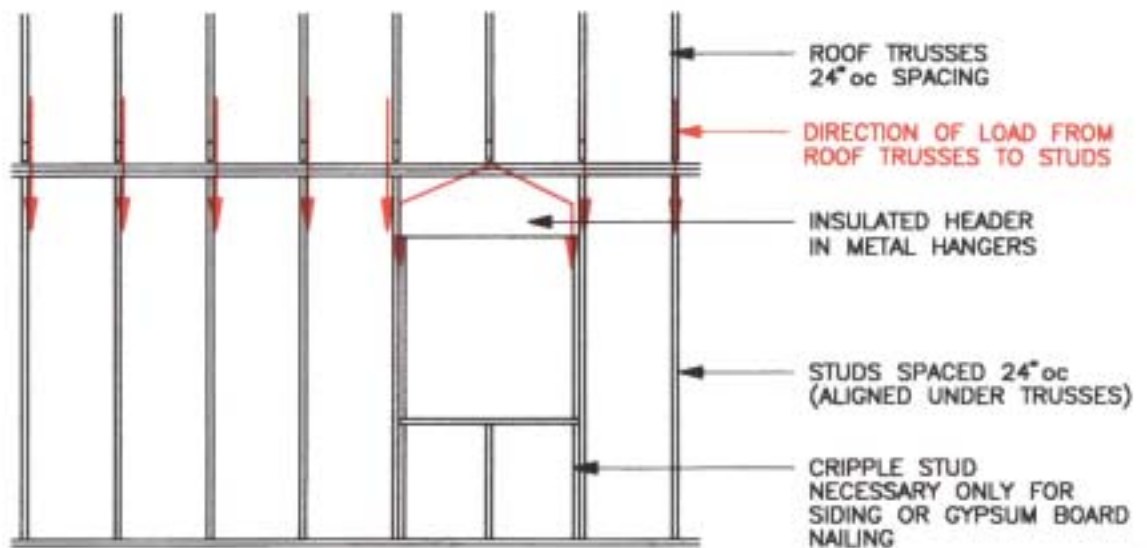


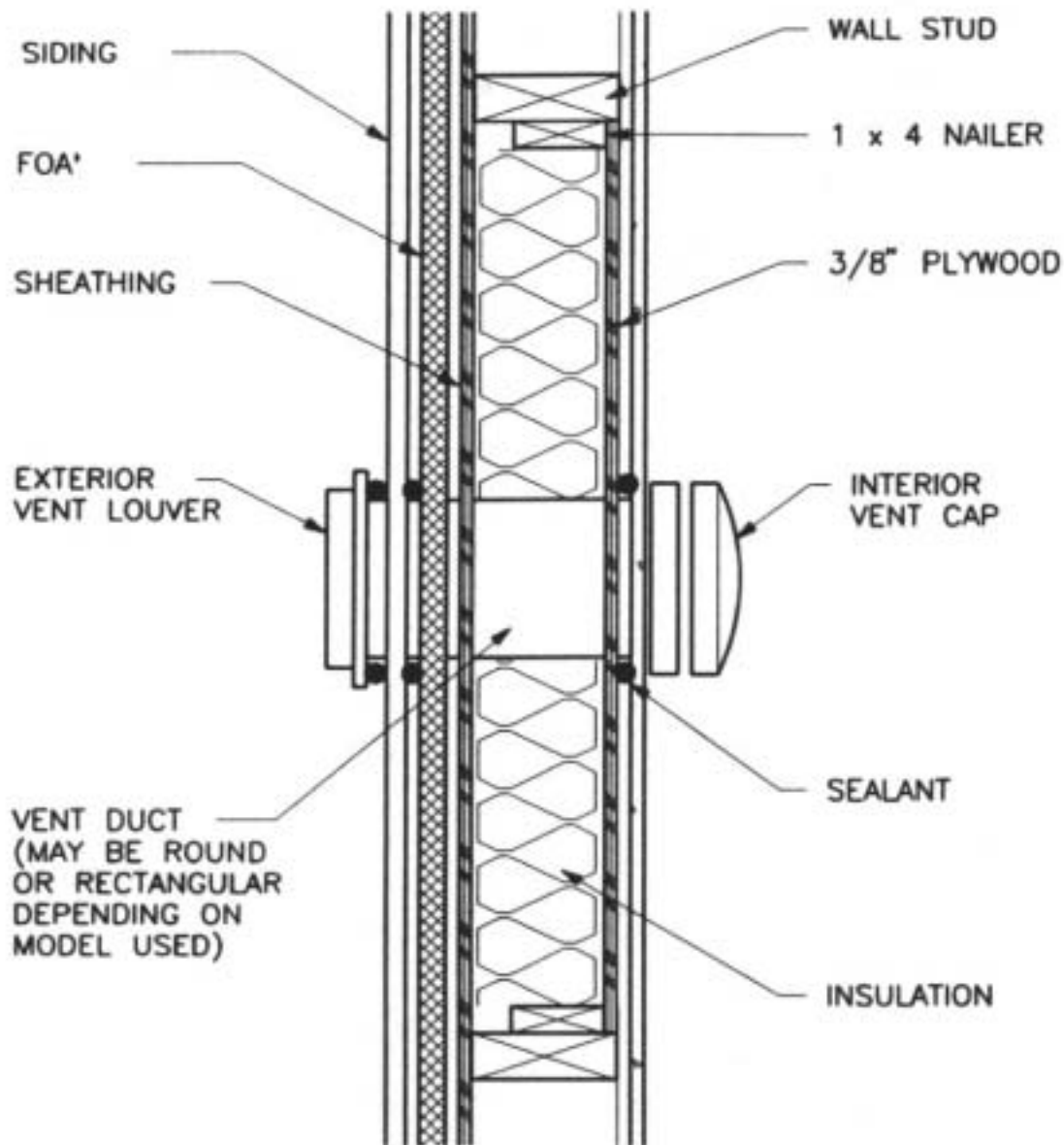


Figure 4J shows one way to install a through-the-wall vent.

TIP: Vents may need backing or other special support to take the strain of operation over a period of time. Install backing at vent locations before the drywaller closes in the walls. The framing stage is a good time to install vents so they are in place before siding and drywall.

Figure 4J

AIR INTAKE VENT INSTALLATION



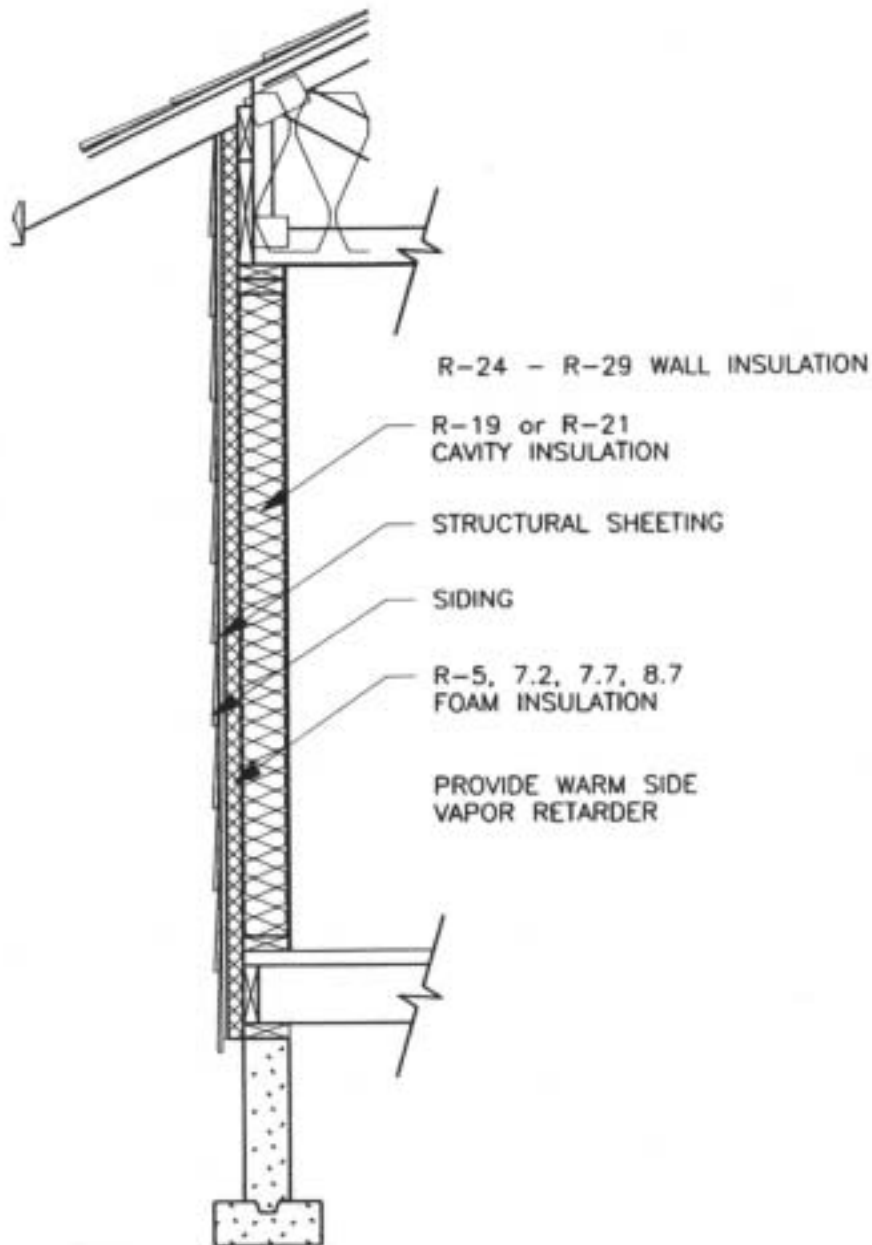


EXTERIOR INSULATING SHEATHING

To reduce wall heat loss, many Super Good Cents homes apply exterior insulating wall sheathing—usually rigid foam insulation. See Figure 4K. If you have not used insulating sheathing before, anticipate changes in your present practices.

Figure 4K

ABOVE GRADE WALL: EXTERIOR RIGID INSULATION





Important Advantages of Exterior Rigid Insulation

Besides substantial energy savings, exterior insulation has other advantages for wall assembly:

1. Foam sheathing is a highly effective barrier to water penetration from the exterior of the wall. This helps to minimize moisture accumulation and potential damage in exterior walls.
2. Exterior insulating sheathing helps keep the wall cavity warmer, improving drying potential of the wall. Since walls accumulate moisture during the coldest parts of the year, warming the wall during cold weather means more drying time.

Field research has found that walls with exterior foam sheathing have significantly lower moisture levels.

Structural Considerations

Foam insulation does not have structural properties. You can use your standard structural sheathing with the foam.

If you substitute insulating sheathing for structural sheathing (such as plywood or oriented strand board), and you do not use structural siding, you may need to use bracing to provide structural support for the wall. Wood or steel diagonal bracing can be used for most two-story construction.

Table 4.1 is a summary of CABO One and Two Family Dwelling Code requirements for wall bracing. The table shows just one example of code requirements for bracing. For other residential buildings, consult the Uniform Building Code or other applicable local codes.

Metal bracing may be more convenient for some builders. Some “L” and “T” metal bracing is designed to act in both tension and compression and can be installed at a 60° angle rather than at 45° to avoid interfering with window placement. Follow manufacturer’s requirements when installing metal bracing products.

In many cases, structural siding, including 303 structural sidings, may be applied over foam sheathing without additional bracing. Technical Note #C465C from the American Plywood Association (P.O. Box 11700, Tacoma, WA 98411; 206-565-6600) includes details and recommendations for this application.

Structural sheathing may be used in addition to insulating sheathing, normally with the foam on the exterior. Of course this adds thickness to walls. That affects window, door, and other trim installation. Structural sheathing also is more expensive than diagonal bracing.



Figure 4L shows a way to inset rigid insulation to allow for more standard structural sheathing details. Wall corners built this way are slightly less efficient. The foam does not cover the framing, and insulation in the cavity is compressed somewhat by rigid foam in the cavity.

Table 4.1

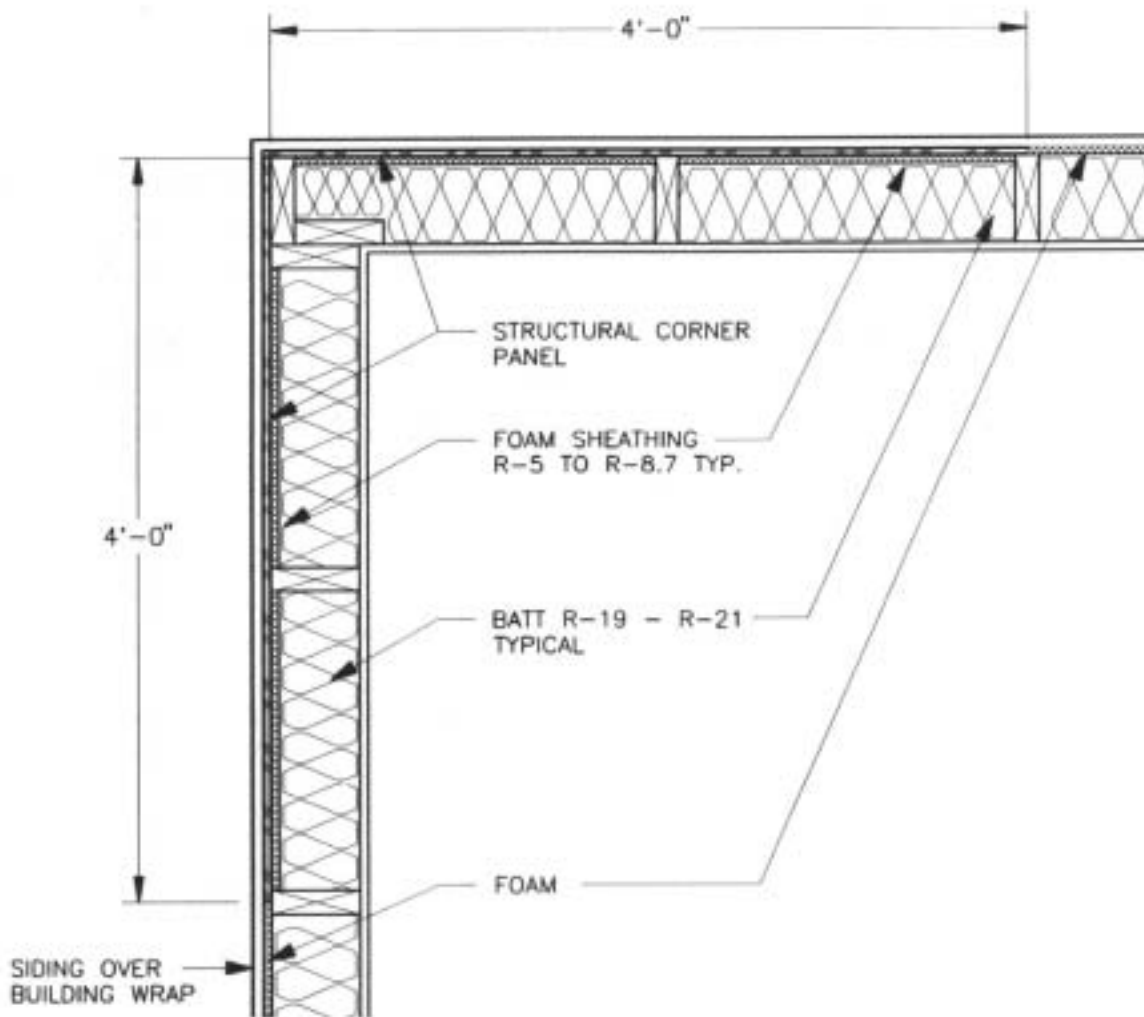
TYPICAL WALL BRACING REQUIREMENTS*

	LOCATION	BRACING
Seismic Zones 0, 1, and 2	Any story except first story of three-story	1x4 let-in bracing or structural sheathing at each end plus every 25 ft of wall length
	First story of three-story	48-inch-wide structural sheathing at each end plus every 25 ft of wall length
Seismic Zones 3 and 4	Single story or top story of two-story	1x4 let-in bracing or structural sheathing at each end plus every 25 ft of wall length
	First story of two-story or second story of three-story	Structural sheathing at least 25 percent of wall length
	First story of three-story	Structural sheathing at least 40 percent of wall length

*Summary of requirements in CABO One and Two Family Dwelling Code. Jurisdictions adopting other codes may have different requirements. Consult your local building department.



Figure 4L
CORNER WITH INSET RIGID INSULATION



Installing Siding

It is important to follow industry guidelines when installing siding over foam. Table 4.2 gives guidelines recommended by siding and insulation industry associations.



Table 4.2

NAIL SIZES FOR SIDING OVER FOAM SHEATHING

Sheathing-Siding Combinations	Recommended Nail Length	
	Smooth Shank	Ring Shank
	Penny (inch)	
<i>Bevel Wood or Hardboard:</i>		
1/2" Siding + 1/2" Foam Sheathing	9d (2-3/4")	7d (2-1/4")
1/2" Siding + 3/4" Foam Sheathing	10d (3")	8d (2-1/2")
1 1/2" Siding + 1" Foam Sheathing	12d (3-1/4")*	10d (3")
5/8" or 3/4" Siding + 1/2" Foam Sheathing	10d (3")	8d (2-1/2")
5/8" or 3/4" Siding + 5/8" or 3/4" Foam Sheathing	12d (3-1/4")*	9d (2-3/4")
5/8" or 3/4" Siding + 1" Foam Sheathing	16d (3-1/2")*	10d (3")
APA Rated Structural Siding:		
1 1/2" or less Siding + up to 1" Foam Sheathing	8d box	—
Greater than 1/2" Siding + up to 1" Foam Sheathing	10d box	—

*These diameters may cause wood siding to split. Pre-drill siding to prevent splitting.

Information from:

Guidelines for Installing and Finishing Wood Siding Over Rigid Foam Sheathing, Western Wood Products Association, Yeon Building, 522 SW Fifth Ave., Portland, OR 97204-2122; 503-224-3930.

Plywood Siding Over Rigid Foam Insulation Sheathings, Technical Note HC465, American Plywood Association, P.O. Box 11700, Tacoma, WA 98411; 206-565-6600.



Performance of lap siding is likely to be improved by providing a 3/8-inch or larger air space between siding and sheathing, regardless of the sheathing material. In fact, some siding manufacturers require an air space when their materials are applied to foam sheathed walls. This air space allows siding to dry from both front and back, reducing any splitting or cupping.

The usual method of providing an air space is to nail furring strips into each stud to hold the siding away from the sheathing. Install bug screens at openings at the top and bottom of siding.

Many stucco-like finishes are designed for application over foam insulation. Each manufacturer recommends a specific application procedure.

Trimming Corners and Openings

Rigid insulation adds thickness to walls and is nonstructural. These two factors require you to pay special attention to providing backing at corners and rough openings for trim. Figures 4M and 4N show typical details, but feel free to design your own. Many options are possible.

Just be sure you frame so that there is nail backing for all trim pieces. Figure 4N shows a 2x4 turned flat for corner board backer. Turning the backer flat allows cavity insulation to get all the way into the corner.

OTHER ENERGY EFFICIENT WALL SYSTEMS

Double Wall Construction

Typical double wall construction consists of two 2x4 walls with 3-1/2 inches or more between them. The inside wall is usually nonstructural. This allows for inexpensive R-11 batts in stud cavities and between walls for a total insulation value of R-33 or higher.

Framing techniques for these walls are not unusual. Work out the following details with the general contractor to help you make your bid:

1. How will window and door rough openings be framed? A plywood wrap is typical.
2. How should you fire stop the walls at the top plates? A 2x the same width as the space between the walls is typical. Some builders cap the top with plywood as the fire stop.

Figure 4O shows double-wall construction details.



Figure 4M
DOOR REINFORCEMENT FOR EXTERIOR RIGID INSULATION

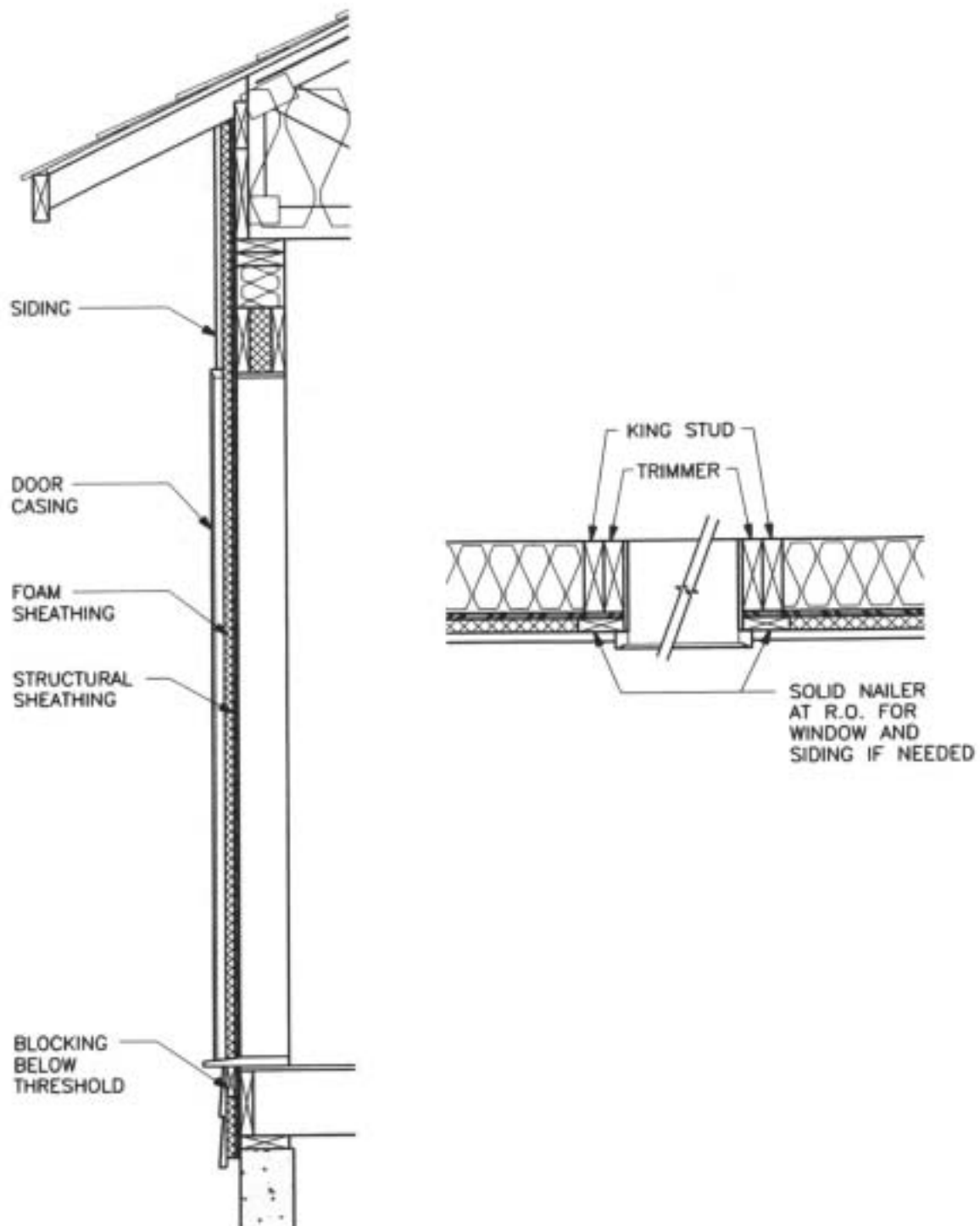




Figure 4N
CORNER TRIM DETAIL FOR EXTERIOR RIGID INSULATION

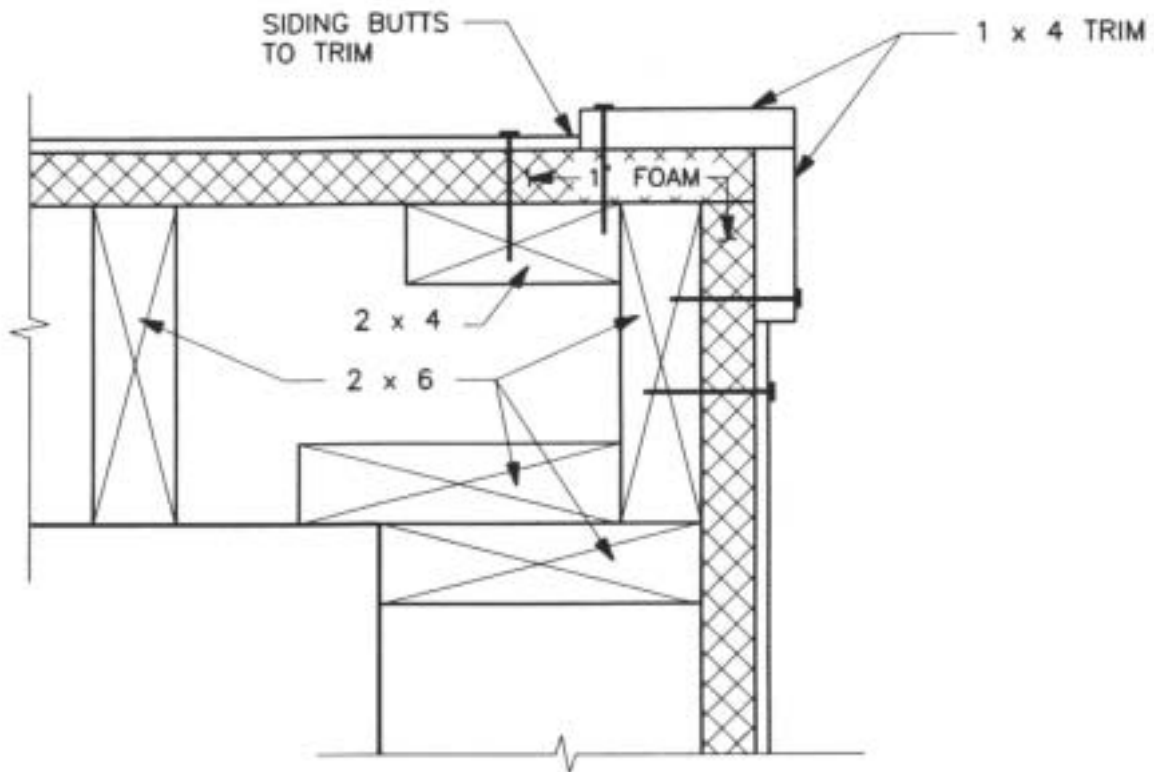
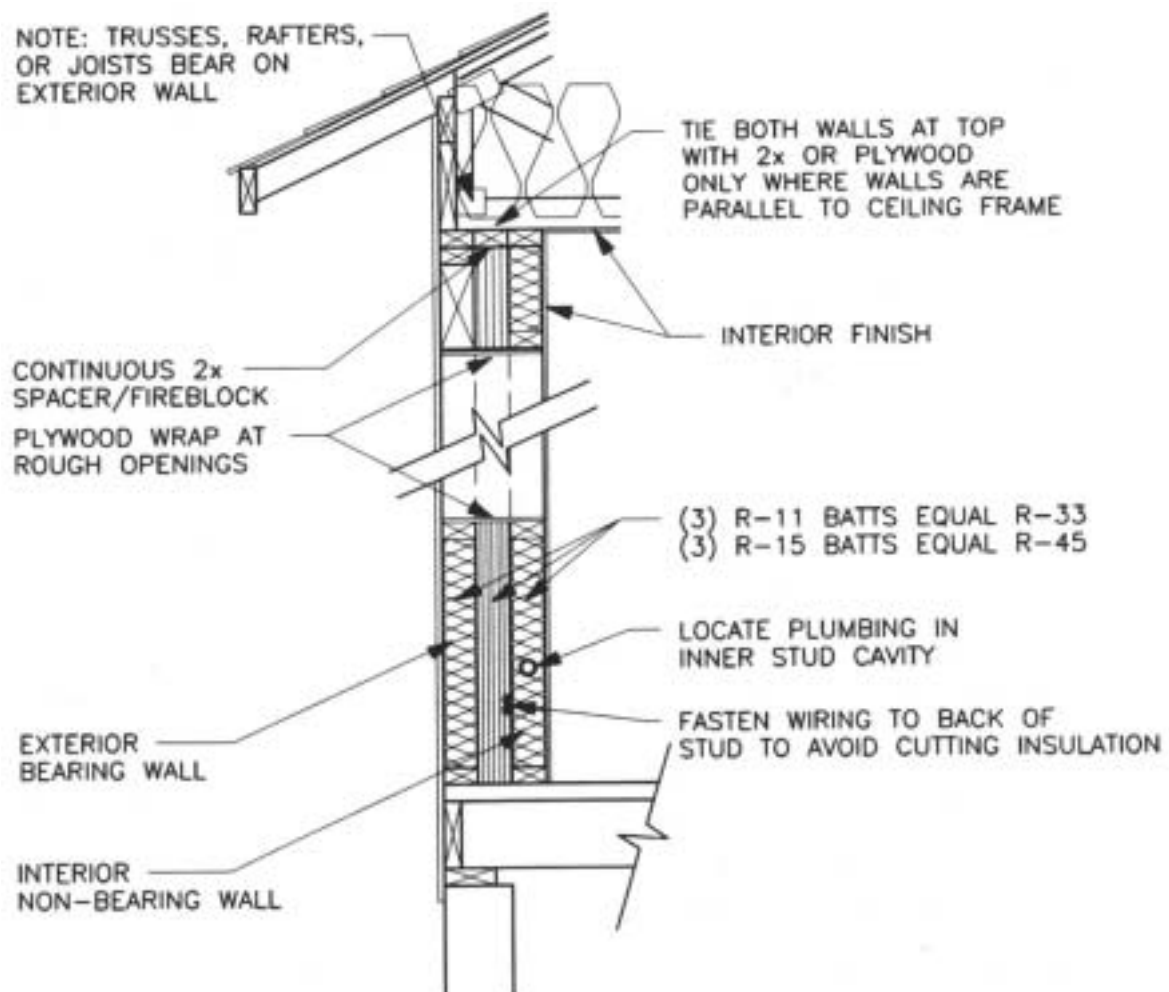




Figure 4O
DOUBLE WALL





Stress Skin Walls

Stress skin panels consist of a foam core with structural sheathing glued to both sides. Panels range in size from 4x8 ft to 8x28 ft. They typically are rated for use up to three stories with no additional framing material other than top and bottom plates, window and door openings, and headers for long spans. Some panels, including a 6-1/2-inch panel that uses 1-1/4 lb per ft³ EPS (expanded polystyrene) foam, have energy performance equal to R-26 advanced frame walls. Stress skin panels that use polyurethane foam do not have to be as thick as panels that use EPS to achieve the same R-value.

Many manufacturers produce stress skin panels. Their methods for site assembly differ. If you are working on a house with stress skin panels, have the manufacturer's instructions available onsite. The building department may not be familiar with stress skin panels. Call attention to the panels when you go in for plan review so inspectors will not be surprised onsite. See Figure P.

Advantages of stress skin walls include:

- Siding and interior finish materials are easily applied when skins are nail base rated.
- Moisture is unlikely to enter the wall from inside or outside.
- The building can be closed in quickly if you use large panels.

There are disadvantages too:

- Higher material cost (may be offset by labor savings).
- May need to frame spaces to run plumbing.

Interior Rigid Insulation

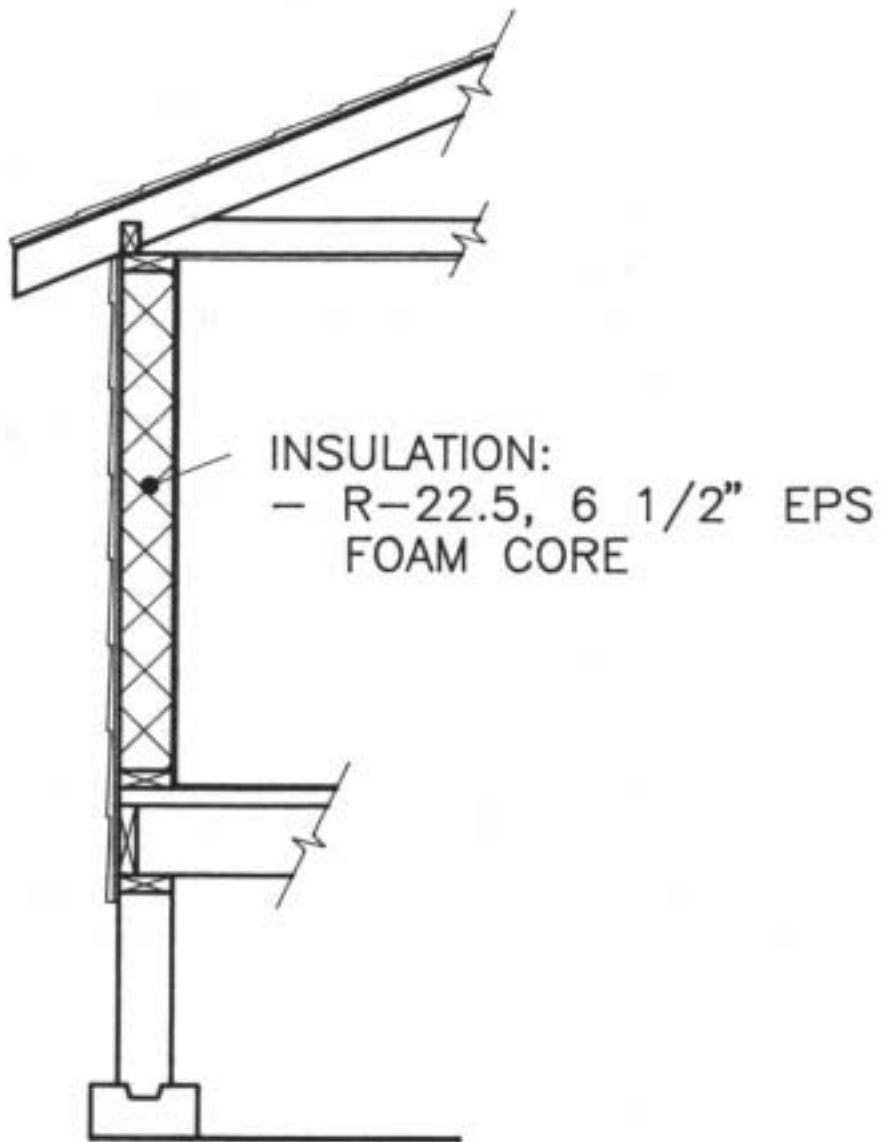
Installing rigid insulation on the inside of the wall provides the same overall R-value as exterior installation. Interior rigid insulation may be installed by crews other than the framers since it goes on after the wall cavity is insulated. Ask the general contractor who will be doing this work.

Three advantages of interior application are:

1. Structural requirements are easily met because it requires no changes to sheathing or siding applications.
2. Rigid foam can double as a vapor retarder if it has a perm rating of less than 1 (foil-faced foam board or extruded polystyrene).
3. If the foam is taped or caulked so that it forms a continuous air barrier, and if it is sealed to ceiling and floor continuous air barriers, it can be part of a whole house continuous air barrier (used in Advanced Air Leakage Control).



Figure 4P
STRESS SKIN PANEL WALL





Disadvantages of interior insulation application include:

1. Nailers and extra drywall backing must be installed around windows, doors, corners, and wall intersections for attaching trim and drywall.
2. Locations of studs must be marked on the inside of foam insulation so drywall installers can find them.
3. Electrical boxes and plumbing stubs must allow for added thickness of the insulation.
4. The wall cavity stays cooler, reducing its drying potential compared to exterior insulation.
5. Interior insulation is not a barrier to exterior sources of moisture as is insulation installed on the outside.

Figures 4Q and 4R show interior rigid foam details.

Strap Walls

Nailing 2x strapping on the inside of 2x6 exterior walls is another option for adding insulation. Typically, high density batts (usually sold for commercial buildings) are installed in the strapping space. See Figure 4S. Often, wiring and plumbing are located in the strapped spaces to avoid interfering with insulation in the main wall cavity.

In most strap walls, the vapor barrier is installed between the main wall framing and the strapping. Ask the general contractor before you finalize your bid if you are expected to do this.

Advantages of strap walls include:

- Ease of running plumbing and wiring without compressing insulation in the main wall cavity.
- Allow for standard sheathing and siding application and nearly standard drywall installation.

Disadvantages of strap walls include:

- Added depth in walls requires casing/jamb extensions for doors and windows.
- Require fire stops between strapping at 10-ft intervals.
- Require additional drywall backers in corners.
- Affect wiring boxes and plumbing stubs.



Figure 4Q

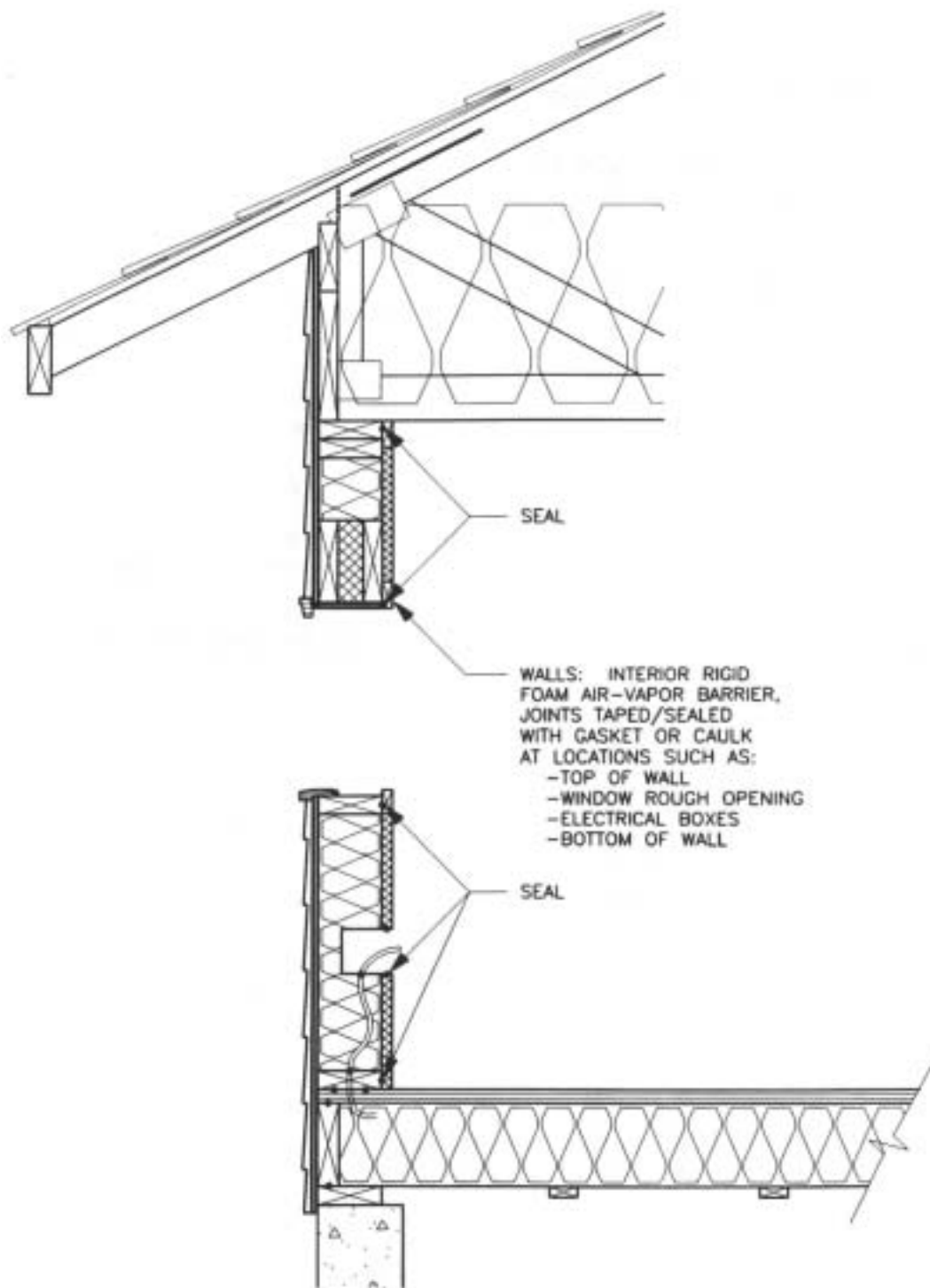
ABOVE GRADE WALL: INTERIOR RIGID INSULATION



Figure 4R
INTERIOR RIGID FOAM FRAMING DETAILS

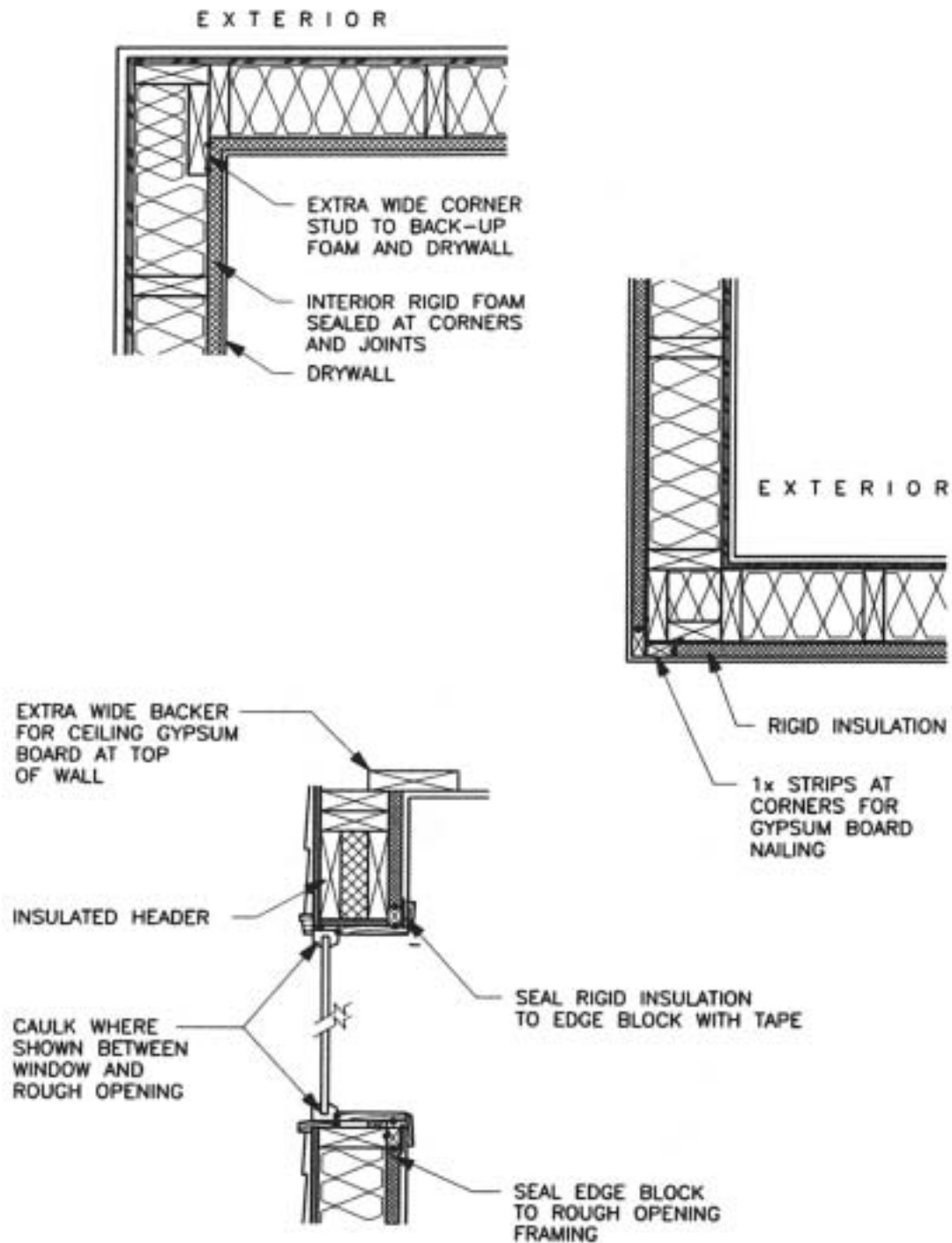
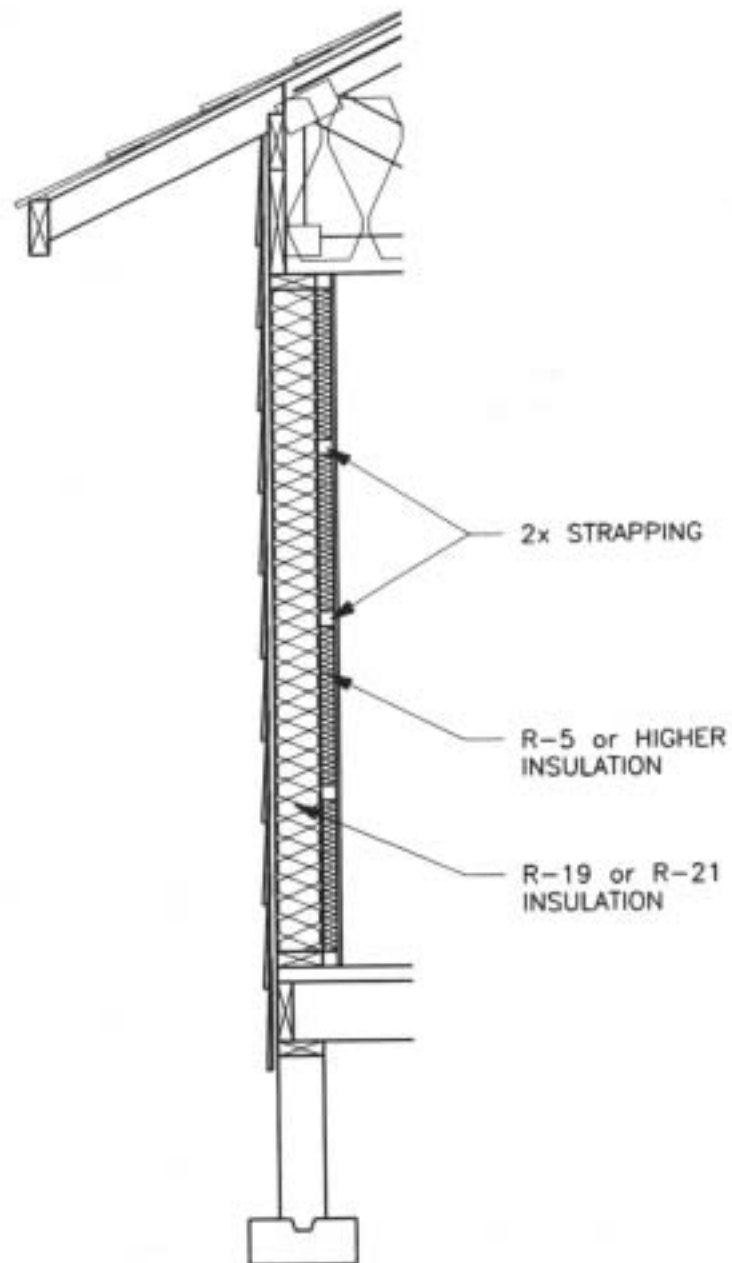




Figure 4S
STRAP WALL





ENERGY EFFICIENT CEILING AND ROOF FRAMING

Advanced Ceiling and Roof Framing

The way you frame a ceiling and roof affects the energy performance of a home. Many Super Good Cents homes use advanced roof framing techniques to minimize ceiling heat loss.

The main objective of advanced ceiling framing is to provide enough space at the ceiling perimeter so that the entire ceiling area can be insulated to the full R-value. In standard ceiling framing, the slope of the top chord or rafter reduces height available for insulation at the ceiling perimeter. See Figure 4T.

Advanced framing allows for full insulation values by using raised heel trusses, oversized trusses, high R-value per inch insulation, or combinations of framing and high R-value insulation. The specification allows any combination of insulation materials, heel height and baffles that provides at least R-25 at the outside of the exterior wall, increasing to R-38 at the inside of the exterior wall, and leaves a ventilation space between the insulation and the roof sheathing.

Advanced Trusses

A raised heel truss is an exposed rafter tail truss with webbing members that raise the height of the top chord. Raised heel trusses allow extra space for insulation over the exterior walls. If the plan calls for raised heel trusses, check with the general contractor about how the extra height to rafter tails will be finished. Your bid needs to include extra materials for this additional area.

An oversized truss (sometimes called a cantilever truss) is longer than a standard truss. The extra length provides added height above the exterior wall. Soffits typically are closed in, so include this extra cost in the bid.

The point on the truss that bears on the exterior wall is different for an oversized truss and a standard truss. Specify to the truss manufacturer where this point is. If trusses that arrive onsite do not have a web member that lines up over exterior walls, check with the truss supplier to make sure you have the right trusses.

As with any roof truss, raised heel and oversized trusses must be blocked or braced to provide shear resistance and to prevent “rolling.” Consult the truss manufacturer for specific recommendations. To avoid the cost of solid 2x blocking, your truss manufacturer may be able to make up blocking made of a 2x frame with plywood or oriented strand board webbing.



Figure 4T
STANDARD AND ADVANCED ROOF FRAMING

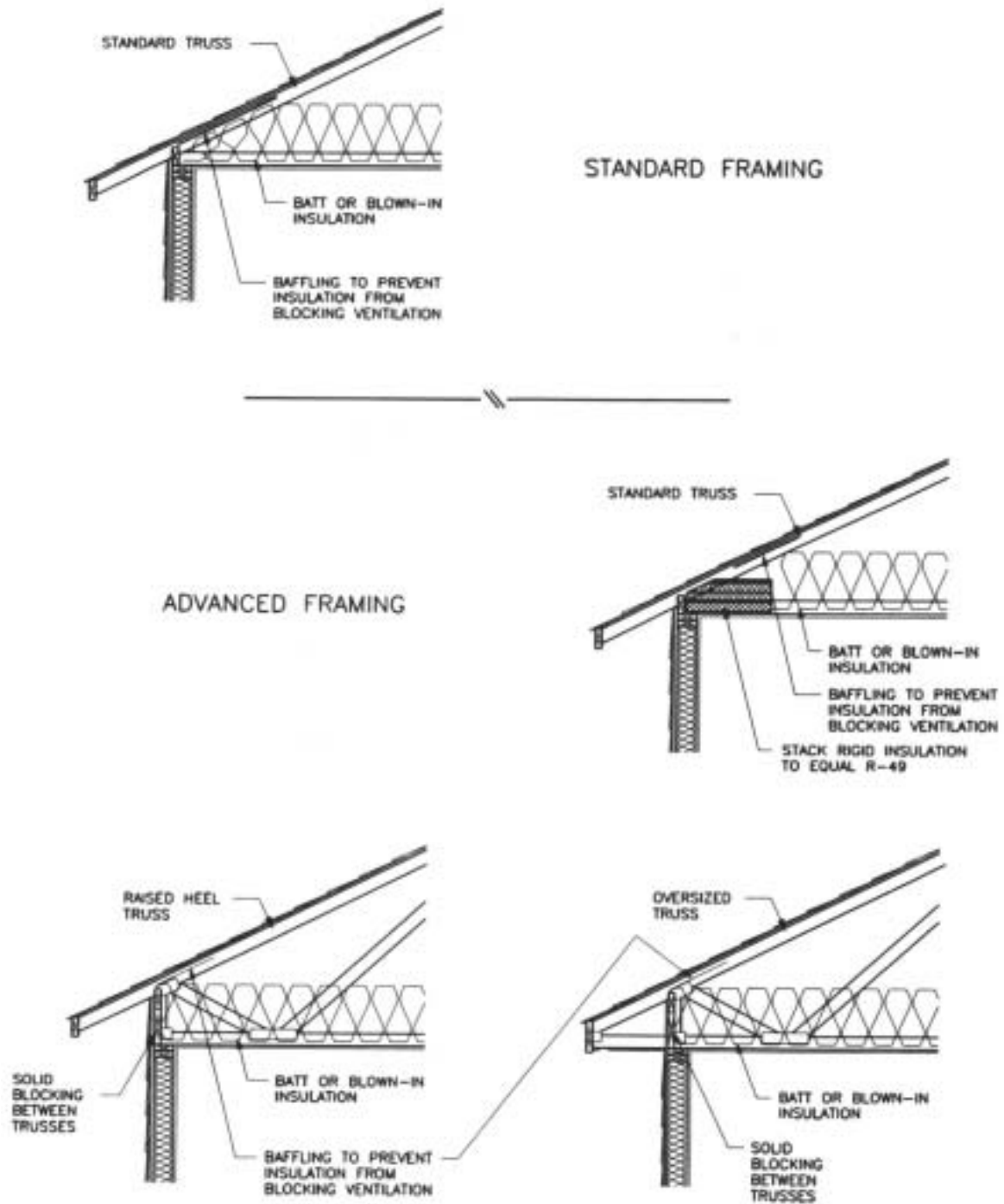
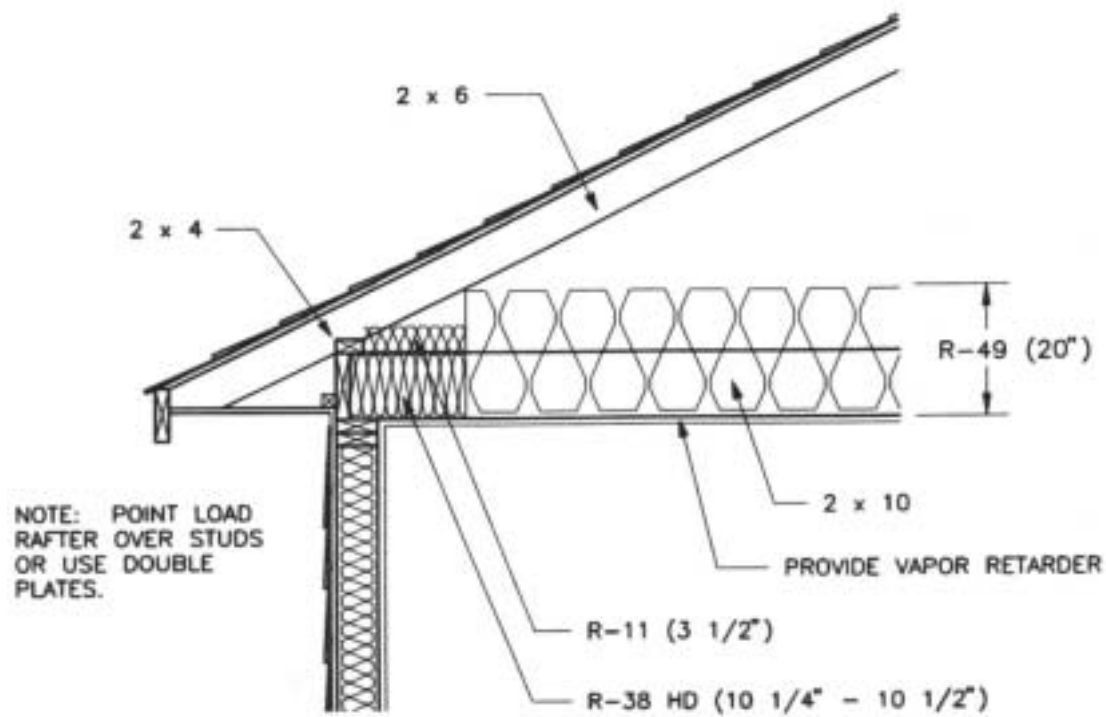




Figure 4U
ADVANCED RAFTER FRAME ROOF





Advanced Stick Frame Roofs and Ceilings

You can get extra height for insulation for stick frame roofs by adding a “plate” to the top of ceiling joists and resting the rafter on that plate instead of the ceiling rim joist. See Figure 4U. Height available for insulation is determined by size of ceiling joists and rafters.

IMPORTANT: Stick frame roofs are not standard. They must be engineered on a case-by-case basis. Rafters must be tied to ceiling joists with straps or ties to resist horizontal roof loads. Consult with a structural engineer for appropriate structural ties and fasteners. You may need to block rafters to prevent rolling.

How Much Height Do You Need?

To meet Super Good Cents requirements for advanced roof framing, the insulation value over the top plates of outside walls must be at least R-38 at the inside wall edge. Table 4.3 shows the height needed to achieve R-38. Most utilities accept as advanced framing trusses that have 12 inches of height available for insulation above outside walls.

Table 4.3

TYPICAL INSULATION THICKNESSES FOR R-49 AND R-38

(not including ventilation space, typically 1")

	R-49	R-38
<i>Fiberglass:</i>		
Blown-in	20"	16"
Standard batts	16"	12"
High density batts	14.5"	10"
<i>Other Mineral Wool (rock wool)</i>	14.5"	11"
<i>Cellulose (blown-in)</i> (R-3.5 per inch)	14"	11"
<i>Foam:</i>		
Urethane/isocyanurate (R-6.2 to R-7.2 per inch)	7-8"	5-6"



To minimize height required for advanced framing, you can use insulation with a higher R-value per inch over exterior walls. Urethane foam, for example, can provide R-38 with 6 inches of clearance. This allows for advanced framing with standard trusses that use 6x top chords.

With a raised heel truss, getting adequate height for insulation is fairly simple. Just specify the height of the heel that gives at least 12 inches of height for insulation. For example, with 2x4 trusses, the raised heel must raise the top chord roughly 6 inches above the bottom chord. Width of the top and bottom chords gives you the rest of the height you need for insulation.

Things get a little more complicated with oversized trusses. Length of the overhang and pitch of the roof determine height available for insulation.

Table 4.4 shows the height available for insulation for oversized trusses. Measurements include space provided by the top and bottom chords and allow for a 1-inch space above insulation for ventilation.

The table shows that even with a 24-inch overhang, a 4/12 pitch does not allow for 12 inches of blown insulation. However, a 24-inch overhang provides room for an R-38 high density batt.

Table 4.4

HEIGHT AVAILABLE FOR INSULATION IN OVERSIZED TRUSSES

(from bottom of bottom chord to 1" below top of top chord)

ROOF PITCH	OVERHANG		
	12"	18"	24"
4/12	6.5"	8.5"	10.5"
6/12	9"	12"	15"
8/12	11"	15"	19"
10/12	13.5"	18.5"	23.5"
12/12	16"	22"	28"



Attic Ventilation for Flat Ceilings

1994 LTS GC 4.2.1

Attic venting helps prevent moisture buildup in attics to keep insulation dry and prevent structural damage. In summer, venting reduces heat buildup in attics that can cause living spaces to overheat and air conditioning bills to soar. Roofing materials may last longer when installed over vented areas.

When vents are placed both near the ridge and at the eaves, the Super Good Cents program requires 1 ft² net free area of vent for every 300 ft² of ceiling area. Figure 4V is an example of how to calculate needed vent area and number of vents.

When all vents are at the same level (only gable end vents, for example), 1 ft² net free area of vent is required per 150 ft² of ceiling area.

Vent Placement

Attic ventilation is most effective when half the vent area is near the eave and half is near the ridge. This vent scheme takes advantage of the “stack effect”: Warm air rises and exits through higher vents, drawing in cooler air from lower vents.

One-level venting may meet requirements, but it is not as effective at moving air through the attic. In summer, homes with one-level venting may have greater heat buildup above the ceiling.

Eave Baffles

The eave vents will not work if they are blocked by insulation. Framers often install baffles after the roof is sheathed and before the framing inspection. Baffles keep insulation from blocking lower vents. In some cases, the insulator installs baffles before the wall insulation inspection.

Figure 4W shows baffles for two types of advanced frame trusses. Install baffles to allow a 1-inch air path between the baffle and roof sheathing. That provides maximum room for insulation. Install baffles at the outside of wall top plates so insulation can be installed over outside walls.

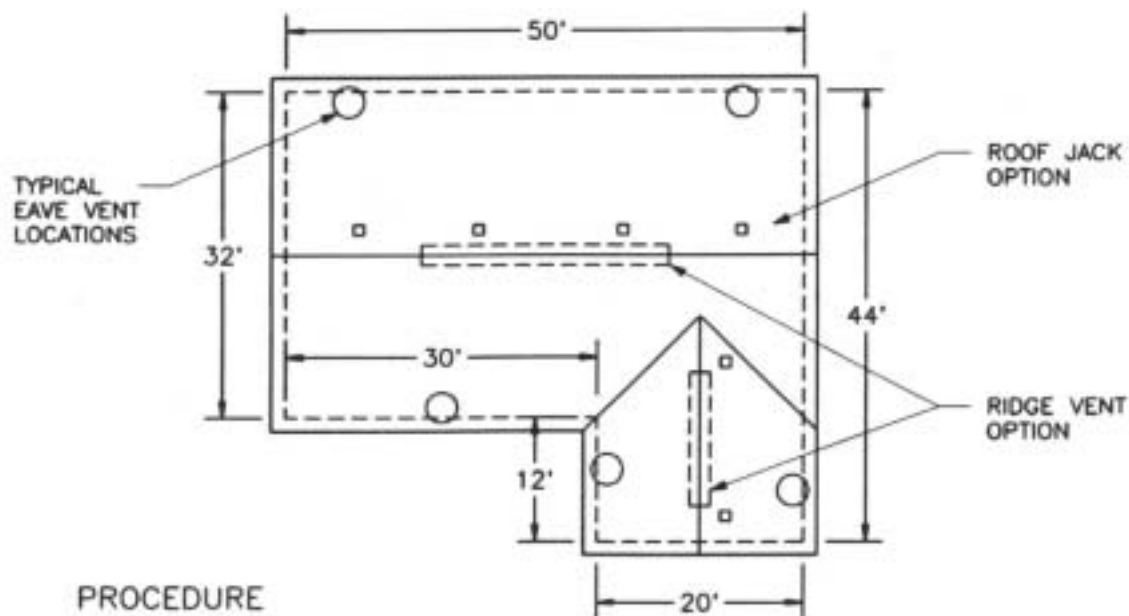
Ridge Vents

If standard vent jacks provide venting near the ridge, the framer typically is responsible for cutting the hole in the roof sheathing and pinning the jack near the hole. The roofer installs the jacks later.

If instead the home has continuous ridge vents, the framer is responsible for cutting the sheathing back from the ridge peak 1 or 2 inches on each side of the peak.



Figure 4V
ROOF VENTILATION



PROCEDURE

1. CEILING AREA
EXAMPLE: $(32 \times 50) + (12 \times 20) = 1840 \text{ sf}$
2. VENT AREA REQUIRED
EXAMPLE: 1sf VENT PER 300sf CEILING AREA
$$\frac{1840\text{sf CEILING AREA}}{300} = 6\text{sf TOTAL VENT AREA REQUIRED}$$
3. DISTRIBUTE VENTS
EXAMPLE: 50% (3sf) AT RIDGE
50% (3sf) AT EAVE
4. NUMBER OF VENTS:
EAVE VENTS:
$$\frac{3\text{sf REQUIRED AREA}}{0.9\text{sf NET FREE AREA PER VENT}} = 3-4 \text{ VENTS}$$

RIDGE VENTS:
$$\frac{3\text{sf REQUIRED AREA}}{0.6\text{sf NET FREE AREA PER VENT}} = 5 \text{ VENTS}$$

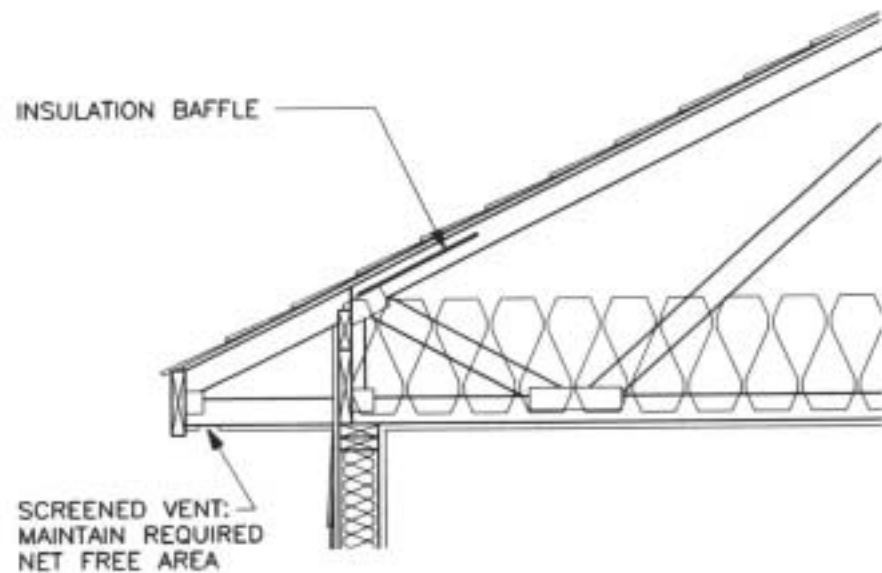
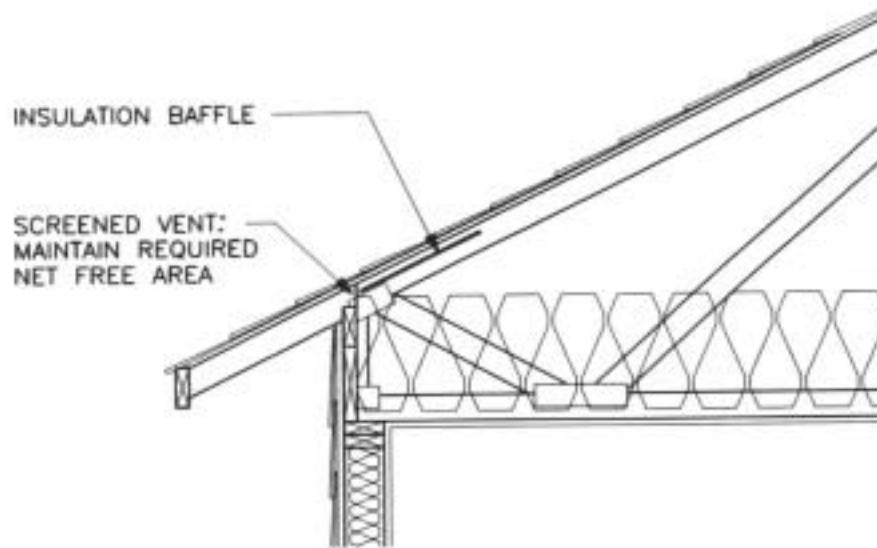
- OR -
CONTINUOUS RIDGE VENT:
$$\frac{18 \text{ sq.in. PER lin. ft.}}{144 \text{ sq.in. PER sq.ft.}} = 0.125 \text{ sq.ft. PER lin. ft.}$$

$$\frac{3\text{sf REQUIRED AREA}}{0.125\text{sf}} = 24 \text{ LIN. FT.}$$

NOTE: VENT RATIO MUST BE INCREASED TO 1/150 IF VENTS ARE ALL ON ONE LEVEL.



Figure 4W
METHODS FOR BAFFLING AT EAVES

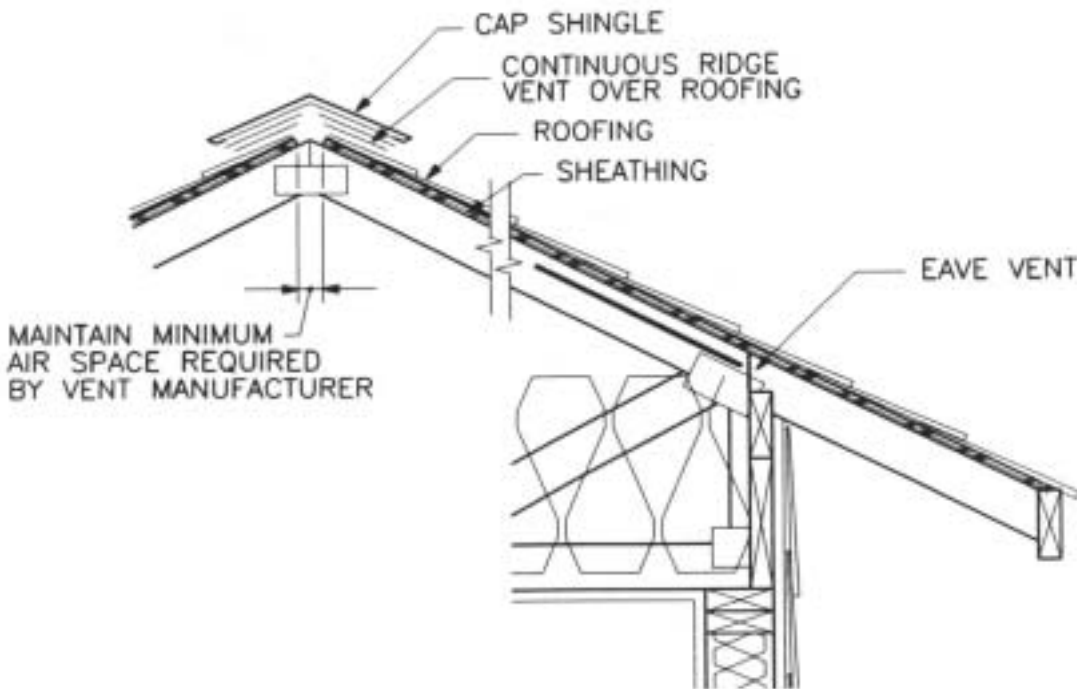


NOTE:
STATE CODE MAY SPECIFY HOW FAR THE BAFFLE
MUST EXTEND BEYOND THE INSULATION.



Figure 4X

CONTINUOUS RIDGE VENT OVER ATTIC



Consult the ridge vent product literature for exact dimensions of the cut. Figure 4X shows a typical detail.

Fan Vents

To keep fan duct runs short, dedicated fan vents may exit through the roof directly above each fan.

Framers may be responsible for cutting holes for fan vents. Pin vents in place for the roofer to install later.

Attic Access

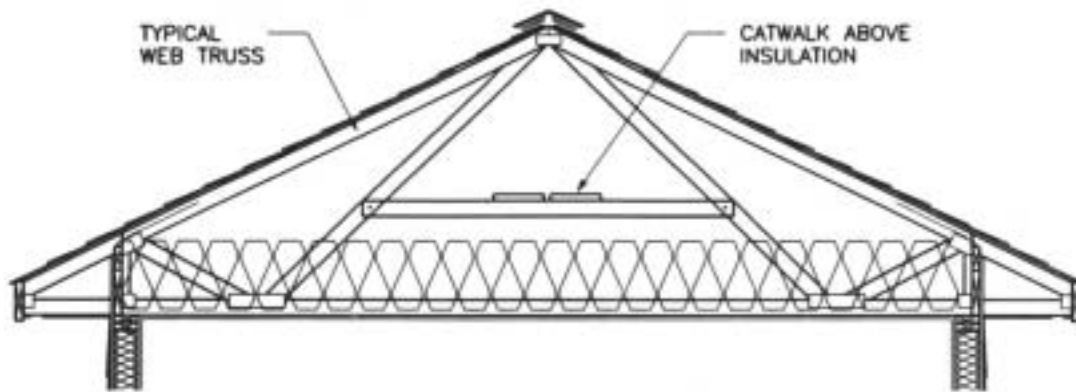
Framers also install the attic access hatch. A leaky attic hatch inside the heated space allows significant heat loss to the attic. It also allows moist air from the house to get into the attic, where it can cause moisture problems. The best place for an attic entry is outside the heated space—in the garage ceiling, for example.

Catwalk

The finished attic often contains more than 20 inches of insulation. If there is room, frame in a catwalk above the insulation. A catwalk allows access to all parts of the attic without disturbing insulation. See Figure 4Y.



Figure 4Y
ATTIC CATWALK



Vaulted Ceilings

Vault cavities restrict space for insulation. It can be challenging to achieve Super Good Cents levels of insulation in vaults. Figure 4Z-1 shows a standard stick frame vault and other framing options for achieving high vault R-values.

With newer insulation materials such as high density batts and high R-value per inch blown-in materials, Super Good Cents insulation levels can be achieved with 12x rafters. Many contractors use wood I-beams or other types of parallel trusses in vaulted ceilings. These materials make it easier to get deep vaults with lower weight, easier handling and less seasonal wood movement.

One new method using wood I-joists is to cut and fit rigid foam insulation between the joists, using the joist flanges to hold insulation in place.

Another way to get high vault R-values is to use stress skin panels engineered for use as vaulted ceiling panels. They are similar to the stress skin wall panels discussed earlier in this chapter. Panels are available that exceed Super Good Cents requirements for vaults.

Stick with the vault depth and R-values shown on approved plans. If you need to make a change, let the Super Good Cents utility representative know.

Vault Cavity Ventilation

1994 LTSGC 4.2.1

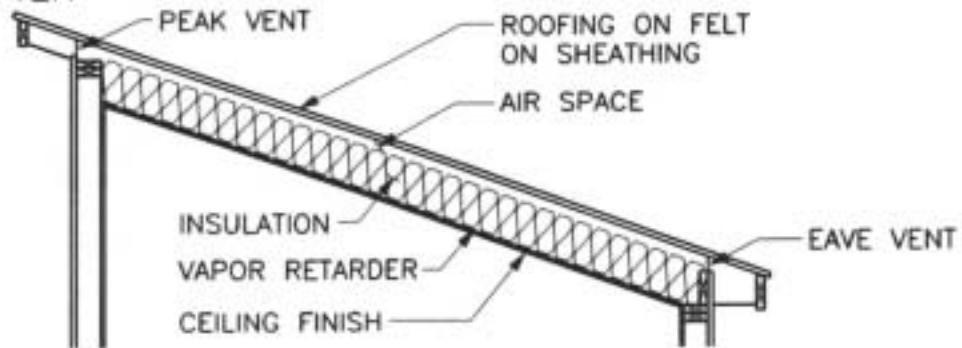
Super Good Cents specifications call for ventilation above all ceiling insulation, including vaulted ceilings.



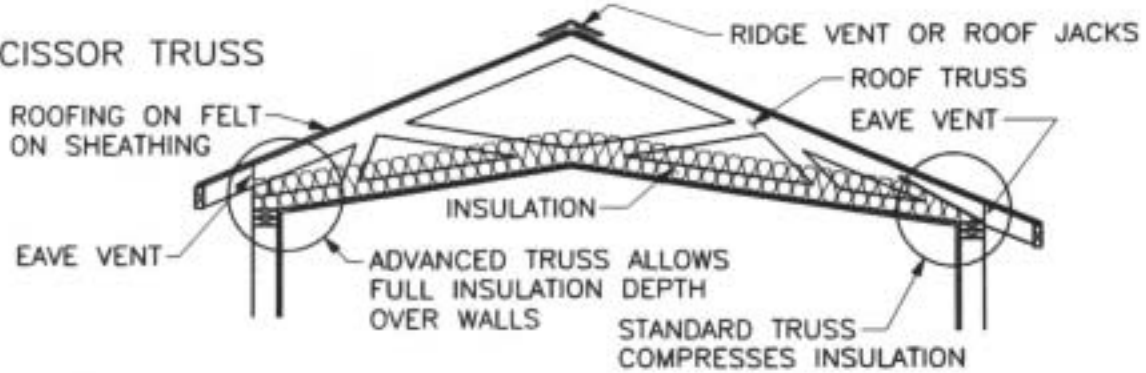
Figure 4Z-1

**VAULT FRAMING METHODS:
SINGLE RAFTER, SCISSOR TRUSS, AND FLAT TRUSS**

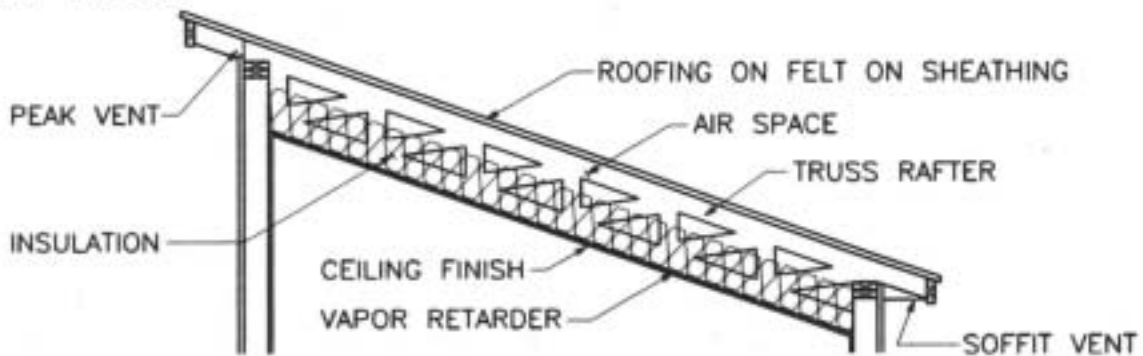
SINGLE RAFTER



SCISSOR TRUSS



FLAT TRUSS





One level venting should equal 1 ft² net free vent per 150 ft² ceiling area. The ventilation ratio for high-low venting is 1/300. Vault ventilation is easier with scissor trusses, deep flat trusses, and wood 1-beams than with stick-frame single rafter vaults.

Building code requirements for vault ventilation vary. Some jurisdictions require ventilation of single rafter vaults. Others require that you pack single rafter vaults with insulation and completely close cavities, but provide no ventilation. Building code requirements for vault cavity ventilation take priority over Super Good Cents specifications. Be sure you know local requirements before you start the job.

Energy efficient vaults have a deep rafter cavity (12x or greater) to provide room for R-38 insulation and air space for ventilation. Standard roof vents do not work well in vaulted ceilings. Air entering through the eave vent has a hard time finding a way out at the ridge.

New products make vault ventilation easier. High density insulation batts and blown-in materials make it possible to achieve R-38 in a 2x12 vault and still have a 1-inch air space for ventilation above the batt. New vault vents make it possible to provide a continuous vent at the vault peak.

In Northwest climates, ventilation may help prevent moisture buildup in ceiling insulation and structural members. Ventilation also helps reduce heat buildup in summer. Because excessive heat buildup may shorten the life of composition roofing, some composition roofing manufacturers void their warranty if composition is installed over closed (unventilated) vault cavities. Newer vault ventilation schemes should help keep warranties active.

Figures 4Z-2 and 4Z-3 show methods for venting vaults. Figure 4Z-2 shows methods that provide continuous ventilation. Figure 4Z-3 shows a common method designed for cross ventilation between cavities. This system typically is not as effective as continuous vents.

Open Beam Ceilings

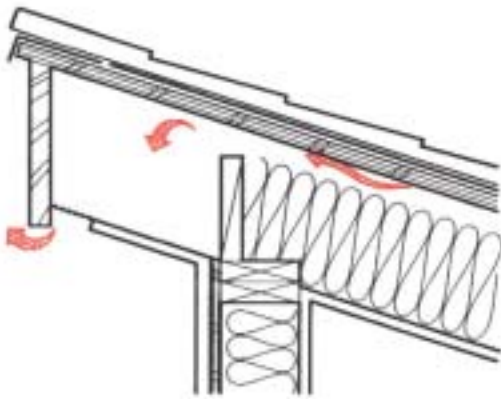
A poorly insulated beam and decking ceiling significantly reduces overall energy performance of the building. If you build open beam ceilings, you probably need to increase conservation levels of other building components to make up for the higher heat loss.

Figure 4Z-4 shows energy efficient variations of the open beam look.

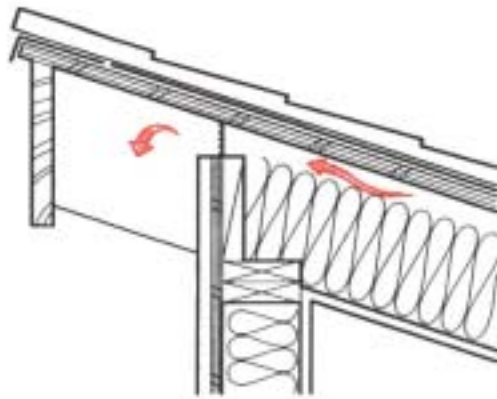
Another option is to use insulated sandwich panels laid over open beams. These are similar to the stress skin panels discussed in the wall and vaulted ceiling sections in this chapter. Insulated sandwich panels are available with a nail base on top for roofing. The inside surface can be finished with your choice of materials.



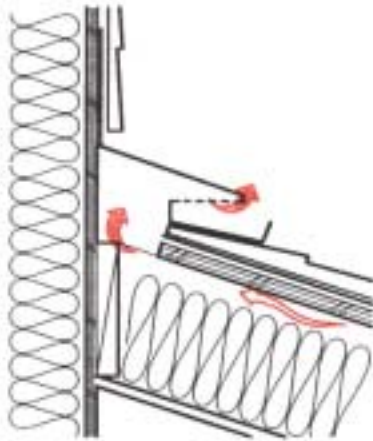
Figure 4Z-2
EFFECTIVE VAULT VENTILATION DETAILS



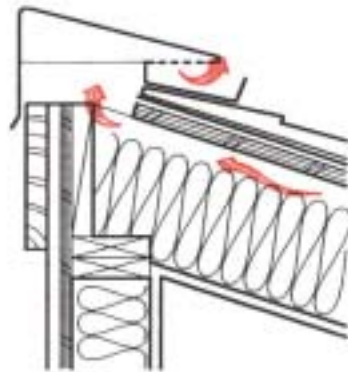
SHED PEAK WITH SOFFIT



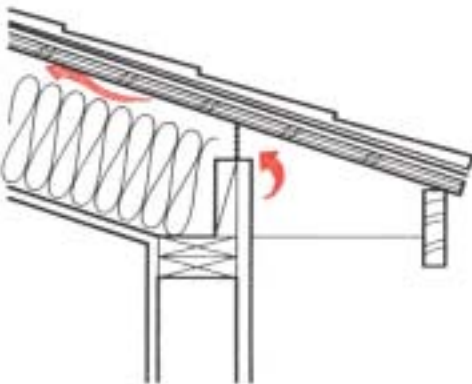
SHED PEAK WITHOUT SOFFIT



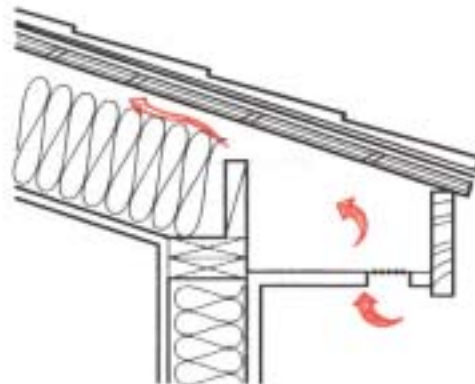
SHED ROOF AT WALL



SHED PEAK: NO OVERHANG



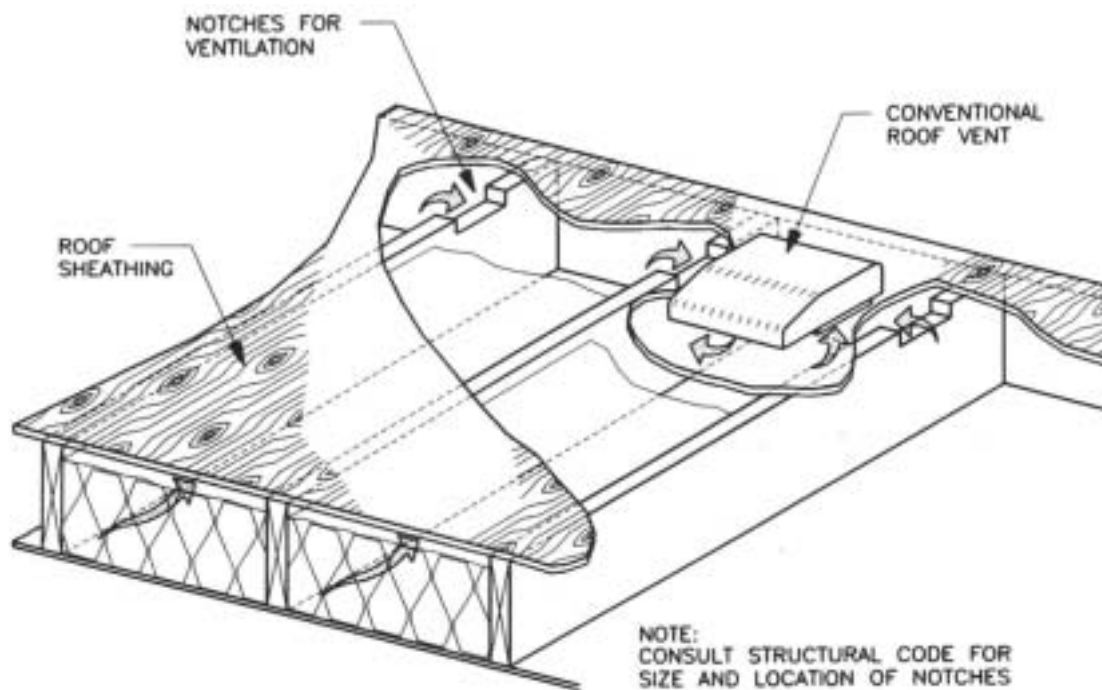
EAVE WITHOUT SOFFIT



EAVE WITH SOFFIT



Figure 4Z-3
CONVENTIONAL VAULT VENTILATION



Air Leakage Control in Beam and Decking Ceilings

Decking shrinks after installation, opening thousands of air leakage passageways. Pony walls between beams and beam pockets at walls also are major areas of air infiltration. Some of these leaks can best be addressed during framing. Others may be attended to later in the construction process.

OPENINGS

Window Installation

The Super Good Cents program emphasizes high quality windows. But windows that open perform poorly if installed out of square. Install windows carefully. Check window operation. Make sure windows close tightly against weatherstripping.

Doors

Make sure exterior and garage passage doors are plumb, level, and square. Make sure they operate smoothly and close tightly against their weatherstripping. Do not forget to adjust the threshold to reduce air leaks at the door bottom.

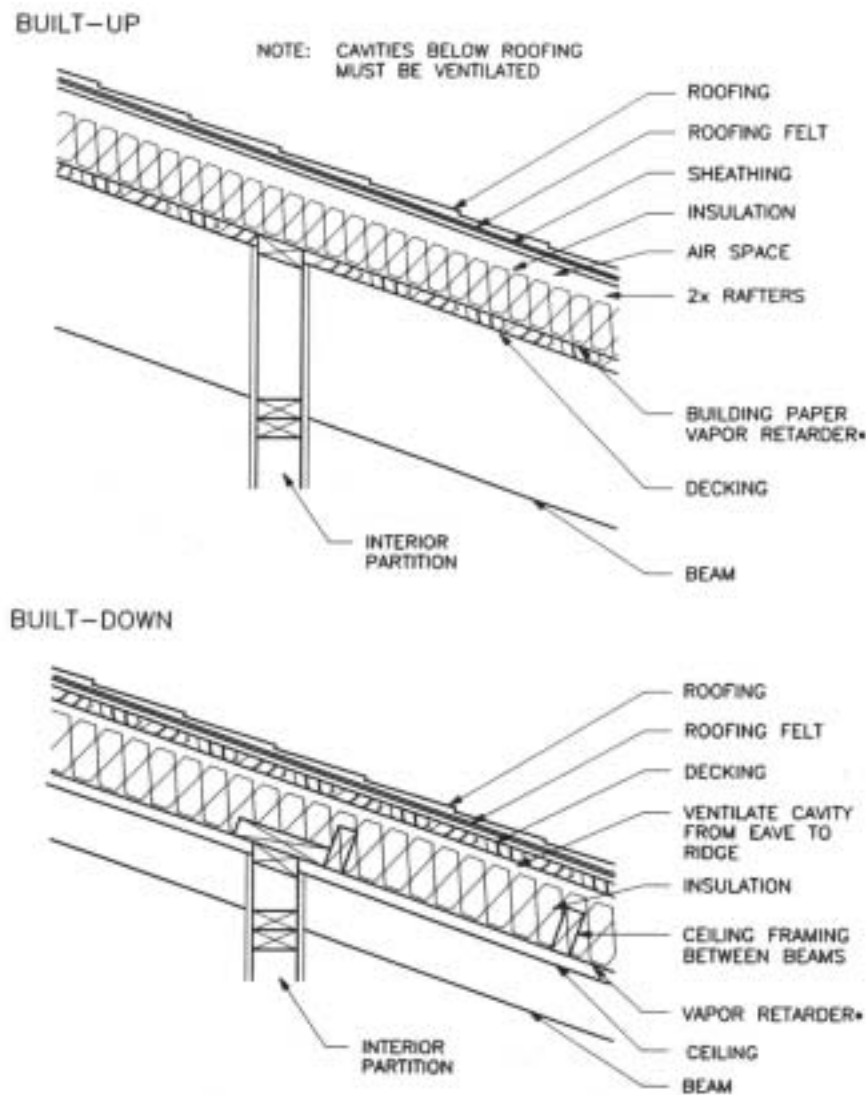


Skylights

Because of their location high above the room and because of the buoyancy of warm air, skylights can act as chimneys for significant air leakage from the home. Since framers build the skylight curbing and place the skylight on the curbing frame, they have the best shot at sealing cracks around curbing and sealing the skylight to the curbing.

Figure 4Z-4

BEAM AND DECKING CEILINGS



* 0.5 PERM/1 PERM TYPICAL.
CONSULT LOCAL CODE OFFICIAL.